



# amateur radio

Vol. 39, No. 1

JANUARY, 1971

Registered at G.P.O. Melbourne, for  
transmission by post as a periodical

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# amateur radio

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## COVER STORY

Arrows point to the insulators at the top and bottom of the 14 MHz. quarter wave vertical aerial on the starboard leg of La Balsa's mast. See story on page 4.



# FEDERAL COMMENT

It was my original intention to devote this Federal Comment to a review of the year just past. I would have preferred to have paid tribute to all those who made the 60th year of the Institute such a special year, particularly all those who supported the Cook Bi-Centenary Award so magnificently, and who turned it into one of the high points in the history of Amateur Radio in Australia.

Unfortunately I cannot do this. At a time when I know that so many of you are on a holiday, I must turn, not to the past, but to the present and to the future. In this holiday season, as I convey to you all the Season's Greetings of the Federal Council and the Federal Executive, I have also to tell you of the serious crisis that we face, and seek your support for the solution we propose.

That we faced a very real crisis in our Federal Administration and with this magazine has been apparent for some time. Both have, since there inception, relied on the labour of honorary officers. But as the years have passed, so our organisation has grown. What was once basically a social group with a common interest has grown into an organisation that is fundamental to our very existence.

The amount of work done by officers such as the Federal Secretary, the members of the Federal Executive generally and those responsible for this magazine has grown to the extent that it is no longer possible to maintain the present level of activity by reliance on volunteers alone. How many of us realise the hours of work each week, each day, that the Editor of "A.R." or the Federal Secretary is called upon to do? I joined the Federal Executive after the Easter 1968 Federal Convention. Before that, as Victorian Federal Councillor, at each Convention, I had been able to sit back and offer the Federal Executive the benefit of my advice as to how they should undertake the many tasks they faced. Now I realise only too well how much work must be done.

Certainly we express our gratitude to those doing the work. But to those people neither gratitude nor the satisfaction of doing something worthwhile is enough. The job itself is too big. They want to be able to earn their

living without having to steal time for the Institute. They want to be able to spend a reasonable time with their families. They even want to enjoy their hobby. In a word, they want "out".

The use of volunteers has slowly drifted into the exploitation of volunteers. These are hard words indeed, but I can assure you, they are justified.

What are the choices open to us?

There are only two. To be effective, and I do believe that at present the Institute is effective, and that the magazine is effective, we cannot do less than we are doing now. Indeed, we are not doing all we should; I am particularly unhappy that we are not giving the Federal Councillors, or the members, nearly as much information as we should. No, we cannot cut back and remain effective.

Can we use even more volunteers? Already, in the metropolitan area of Melbourne there is one job going for each  $\frac{1}{2}$  full members. Quite apart from the fact that we have reached a level of saturation, administration cannot be channelled through an indefinite number of people. In the end, the co-ordination of that kind of administration takes just as much effort as the job itself.

Our choice is simple. We can either have a paid, high level permanent administration, both for the Federal body and the magazine, or we can go back to a vastly lower level of activity and effectiveness, where things *might* be done when someone has the time, with the magazine perhaps duplicated and produced five or six times a year.

The Councils of the New South Wales Division and the Victorian Division have, together with Federal Executive, exhaustively examined the problem. They realise that we cannot go back, and the only solution is the first one.

This means that each member will have to pay more in subscriptions each year. Despite this, both the Victorian and New South Wales Divisions have pledged to a programme involving the employment of a Secretary/Manager. Events have moved quickly. Executive has been able to inform some Divisions, but not all, as fully as we would have wished.

To our surprise, we have found nothing but support. Our members seem to have been more aware of the problem than perhaps we thought. In this issue we advertise for a person to fill this post. Remember, when you read this advertisement, that how our organisation grows will depend very much on the man we get. Accordingly, we are looking for a man with top ability and experience, mainly administrative.

The cost to each member rather depends on the financial structure of the member's Division. Some Divisions will be able to effect some economies by the utilisation of the proposed centralisation of certain records, feasible with a permanent administration. Generally speaking, the direct increase to members in the smaller Divisions (which have lower fees than the larger Divisions) will be greater. It will not be more than \$3 per annum.

I earnestly seek your support. Each member can do two things. First, give your Division your support in these moves. Let your Division know they have your support; when faced with a need to increase subscriptions we are always hesitant. It's not that we do not wish to pay the increase ourselves, it's just that we are worried about the other fellow. We are all "other fellows"—let your Division know that they do not have to fear a general exodus if they increase the fees.

Secondly, each of you can do something to get new members. Only 54% of all licensees are members of the W.I.A. Please, take the time to have a look at the table set out on page 18 of the April 1970 issue. The 46% who are not members take the benefit of the privileges obtained and the protection given by the W.I.A. No membership drives can be as successful as the efforts of each individual member to get new members. The more members we have to share the burden, the lighter the burden is on each individual.

Yes, I would rather have written a Federal Comment dealing with the achievements of the Institute, but this matter cannot wait until February. In my report to the Federal Council last year I said that I believed that the Institute can justify the support it needs.

May we count on your support?

—MICHAEL OWEN, VK3KL  
Federal President, W.I.A.

# La Balsa—a Triumph for Amateur Radio

By DON MARSHALL\*

THE search could be likened to looking for a needle in a haystack. In fact, it was for little more than a switch click somewhere in the Pacific Ocean south of the Equator!

The fact that through the perseverance of Amateur Radio operators in at least four countries, and perhaps only because of their discovery, has the incredible story of La Balsa been told.

It is now history that Vital Alsar, a Spaniard, Marc Modena, a Frenchman, Normand Tetreault, a Canadian, and Gabriel Salas, a Chilean, left Ecuador, South America, on a balsawood log raft last May 29.

On November 4 at 11:30 p.m., they arrived under tow in the Mooloolaba River, 65 miles north of Brisbane, after a voyage of 8,500 miles.

The report of their Amateur Radio activities during that time, as compiled from the men and operators, will have a special place in the minds of all who took part or who at least heard the raft signals.

Although Vital Alsar was primarily an adventurer seeking to prove that an ancient type raft could be sailed with some direction, he also realised some modern radio gear, together with a petrol generator and a fuel supply, would be a necessity on his raft.

On the advice of his friend, Vice-Admiral Samuel Fernandes, a Mexico City Ham, XE1EB, and radio co-

ordinator Raphael L. Corcuera, XE1EEE, a business man, of Guadalajara, Mexico, Vital installed a Hallicrafter SR-150 transceiver.

Installation was under the eye of electronics engineer Joe HC2OM, of Guayaquil, Ecuador, where the raft was built.

Vital was given the call sign of HC9EBP/MM.

The transceiver was largely pre-set to operate on about 14,105 KHz. to limit operating time and thus exposure to the sea air.

The radio was stored in the plaited cane cabin and protected by eight plastic bags.

The aerial was a quarter wave loaded vertical mounted on two insulators taped to the starboard leg of the mast with a lead into the cabin.

Transmissions after the raft started its cross-Pacific drift were good with regular s.s.b. contacts to Fernandes and Corcuera and later with Liliana HC2IS.

Vital joined in La Rueda, the wheel in Spanish but radio net in English, every four days with hardly any interference.

Besides the Mexican and Ecuador stations, there were calls from Nicaragua, San Diego (California) and Montreal (Luc VE2BBS).

Raphael was even able to arrange a rendezvous with a U.S. Navy ship when the La Balsa was down to half a gallon of petrol from an original 17 gallons—enough only for an hour and a half's operating.

## MICROPHONE USELESS

In mid-September came a storm in which waves reached 30 feet and the transceiver in its plastic bags was put under the ceiling for safety as water swept through the cabin. Some shack!

It was little wonder then that on October 3 with the raft east of New Caledonia and approaching the most dangerous part of the voyage, the microphone became faulty.

The next day it failed.

Vital tinkered with it while Raphael and the Admiral, so far away, wondered what to do.

But Vital shorted out the insert so that by pushing the microphone switch he could trigger a signal.

The Admiral devised the system where Vital could give an affirmative answer by pressing the microphone switch and remaining silent for a negative answer.

Then by transmitting digits one-two-three and so on, and listening in between each, he could get a signal from Vital giving the raft's longitude, latitude, air and sea temperatures, wind direction and strength, sea conditions and the condition of those on board.

## ZL THEN VK HELP

Enter into this strange communication, Mr. A. T. "Gus" Knox, ZL1RO, of Epsom, Auckland, an Air New Zealand operations man.

The Mexicans explained all and said that although the raft seemed to hear

\*33 Karawara St., The Gap, Brisbane, Qld., 4001

DSL CARD  
OF  
LA BALSA

Block by  
courtesy of  
Courier-Mail,  
Brisbane





Raft discussion. From left: Keith VK4KS, Marc Modena, Normand Tetreault, Vital Alear and Gabriel Sales. Photo courtesy The Courier-Mail, Brisbane.

them without difficulty, they were having growing difficulty in hearing the reply clicks as the raft drifted west.

At this time, the signals were traveling more than 6,500 miles.

Gus offered to help since with his rotating beam he could hear the clicks easily and his signal on the raft was strong.

This was October 10 and the raft was in danger from the D'Entrecasteaux Reefs ahead, a danger apparently not realised by the men back in Mexico.

A suggestion that a new microphone be dropped from the air was not taken up.

Luckily, the raft passed the northern end of New Caledonia and headed west in the current towards Australia.

On October 12, the raft's position was 162 deg. 43 min. E., 17 deg. 38 min. S., and from that day an alternate day schedule was kept.

For three weeks, Gus hurried home from his job to relay the Mexicans' questions and to relay the clicked replies.

Meanwhile in Sydney, Syd Molen, VK2SG, a senior t.v. technician, had heard about the proposed drift from Raphael, one of his regular contacts.

He had listened on the set frequency but had never talked to La Balsa, so as not to waste the raft's power.

Raphael asked Syd if he would have a go at taking over contact with the raft and Syd made his first contact on his home-brew gear from his 12 ft. x 12 ft. shack at Pendle Hill on Oct. 24.

Then it was his turn to take over from Gus and transmit the questions and then the replies. Gus stood by.

By October 28, the sea temperature had risen 3°C. in two days, which tended to confirm that they were encountering a warm current from the Coral Sea.

Australia was near at hand, but then there were the treacherous Great Barrier Reefs ahead.

On October 29, Les Bell, VK4LZ, a farmer, of Airlie Beach, near Proser-

pine, North Queensland, and Keith Schleicher, VK4KS, of Aspley, Brisbane, had joined in the relays.

#### NEWS BREAKS

The first news reports appeared.

It was important that Les and Keith joined in, along with several others known to be listening on the side, since the raft was approaching the Swain Reefs, east of Rockhampton, the southern end of the main Barrier Reef.

By 1.45 p.m. E.A.S.T. on Saturday, October 31, there can be little doubt that scores of beams, including that of Raphael in Guadalajara, and a Solo-

mon Is. man to the north, were swinging to the Coral Sea area.

This scheduled sked had been published in newspapers and broadcast on radio and t.v.

But such was the discipline of all that Syd and Les between them, with Gus and the Solomon Is. station on the side, were able to make contact at 2 p.m. and there was only one breaker for a brief time.

The raft was then becalmed some 250 miles off from Rockhampton.

This day, the Brisbane Sunday Mail newspaper spent hundreds of dollars on an aircraft charter to spot and photograph the raft, but, unfortunately, the plane had to return from the area before the raft's exact position was transmitted.

The newspaper telephoned Gus and Raphael to confirm that the raft and its signal were no hoax.

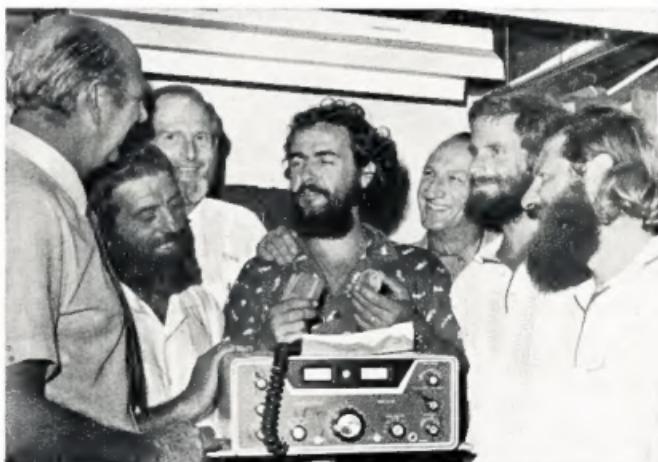
Air Force authorities in Townsville declined news media requests to put one of their Neptune aircraft specially equipped for sea searching into the air. No request had come from Canberra.

Otherwise, official statements that there was no raft, that such a drift was impossible and that the radio signals were a hoax might never have been made.

It was revealed later that the authorities did not have the equipment to pick up the raft's signals. Nor did they have the beam serials of the amateurs concerned that were confirming the raft's position.

#### SEARCH PERMIT REFUSED

On Sunday, November 1, Civil Aviation Department officers in Rockhampton refused permission to allow a twin-engined aircraft proposed chartered by the Australian Broadcasting Commis-



Hallicrafters Transceiver back for the La Balsa crewmen at a Brisbane DX Radio Club function at the OTH of Keith VK4KS at Aspley, Brisbane, on November 13. Picture shows (from left) Club President Mr. C. T. Patterson, Gabriel Sales, W.I.A. Queensland Division President Norm Wilson (VK4NP), Vital Alear, Keith Schleicher (VK4KS), Marc Modena and Normand Tetreault. Photo courtesy The Courier-Mail, Brisbane.

sion and then later by the Brisbane Courier-Mail to search for the raft since the search area was too far off the coast.

For reporters and photographers, a major news event was so near and yet so far, and reporters had to rely on Amateur Radio reports.

On Monday, November 2, from 2 p.m. E.A.S.T., there was the normal position report. The raft was sailing south towards Brisbane and all was well. There was a similar report on the Tuesday with Les and Syd making the contact.

Crisis day came on Wednesday, November 4, when the raft reported its position at 154 deg. 20 min. E., 26 deg. 05 min. S., or about 66 miles northeast of Double Island Point on the Australian mainland.

The raft was being buffeted by a 30-knot south-easter. The crew were all well but were worried by the strong wind.

As they felt they were within Australian waters and near landfall, they thought it advisable to request assistance to stand by.

Following the report, two newspapers put separate aircraft up to search for the raft, but in poor visibility and failing light, it was not sighted.

At Airlie Beach, Les offered to stay up all night keeping a listening watch on the frequency. At Syd's suggestion, the raft was back on the air at 8 p.m. It was then only 16 miles east-northeast of Double Island Point with a 30-knot south-easter still blowing.

At Mooloolaba, 50 miles to the south, a pilot launch with a doctor on board put to sea to search unsuccessfully and returned to port soon after midnight.

At 2 a.m. on Thursday, November 5, the fishing launch Capri, chartered by the local Nambour newspaper, left Mooloolaba to search.

By 5 a.m., the Mexicans were back on the air asking Vital his position, which was two miles off Double Island Point. However, lighthouse men there could not see the raft.

At this time, skip distance prevented Brisbane Amateurs from hearing the raft. It was Syd who asked the questions and Les confirmed the raft's replies.

The untold scores of Amateurs who must also have been listening did not break in.

#### SEEN FROM THE AIR

As air-sea rescue authorities were still maintaining the whole matter was a hoax, the raft was spotted from the air.

After Syd was unable to reach Brisbane authorities by telephone, he asked Keith VK4KS, standing by in Brisbane, to contact them to see if Syd's services were still required. The authorities released Syd and took control.

The raft was later taken in tow by the Capri and it reached Mooloolaba at 11.50 p.m. E.A.S.T.

#### W.I.A. OFFICIALS AT WELCOME

There to welcome them on behalf of Amateurs were the W.I.A. Queensland Div. President Norm Wilson (VK4NP), Vice-President Theo Marks (VK4MU), Keith VK4KS and Ken Chiverton (VK4VC).

About 2.30 a.m., Vital was at Norm's station wagon to contact the Admiral (XE1EB) to confirm the end of a fantastic voyage.

But all was not ended there so far as Amateurs were concerned.

The next day Vital paid a visit to the shack of Kev in Nambour and while there was able to communicate with Mexico and Ecuador.

On Friday, November 13, the four crewmen were in Brisbane and visited the shack of Keith for a late lunch and again were able to have a few words with XE1EEI, XE1EB and HC2OM.

Then on Sunday, November 15, they returned to Keith's for a dinner in their honour, given by the Brisbane DX Radio Club and attended by 50 members and their wives.

At this, Vital was presented with a club certificate and made an honorary member. Here, too, the men received back their transceiver, repaired to first class condition.

Salt water spray had got inside and the microphone had been damaged by electrolysis action. Also, the transmitter was putting out only 30 watts, two tubes were "soft" and tuning was poor. Luck had prevailed!

The debt to all Amateur operators involved with La Balsa from Ecuador to Australia has been acknowledged many times since Vital.

But who would take anything from the magnificence of thefeat by four brave men?

#### TECHNICAL ARTICLES

Readers are requested to submit articles for publication in "A.R." in particular constructional articles, photographs of stations and gear, together with articles suitable for beginners, are required.

## THE WIRELESS INSTITUTE OF AUSTRALIA SECRETARY MANAGER

The Wireless Institute of Australia is a non-profit organisation providing services for and representing Australian Radio Amateurs.

The growth of the organisation has made it necessary to employ a full-time SECRETARY MANAGER.

**Location**—Melbourne.

**Duties**—To act as a Secretary to the Federal Executive and to take responsibility for the administration of the organisation; to act as Manager of the organisation's publications.

**Qualifications**—Proven administrative experience in Commerce, Industry or the Government Service; the ability to keep minutes, write reports and collate information; a knowledge of accounting procedure is highly desirable; must be able to express himself concisely and clearly in writing. Experience in either electronics or Amateur Radio is essential.

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# HOW MANY MIKES?

COL HARVEY,\* VK1AU

Not for the audiophile—but a simple approach to the problem of testing capacitors in the tens of microfarads range

The long standing practice of bridging a replacement capacitor across a suspect electrolytic has much to commend it, particularly in filter and decoupling applications. However, in solid state equipment where even interstage coupling capacitors are likely to be many microfarads, it is generally a nuisance to remove suspect capacitors for test, and more a problem to prove capacitor value and serviceability. As very few Amateurs seem to have access to a polarised capacity bridge, a simple self contained capacity and leakage tester can be a useful substitute. The method used does not give absolute readings, but compares the suspect component with a calibration obtained from newish similar items.

Experience to date shows that capacitor values measured for electrolytics are higher than the equivalent values given by paper capacitors. Apart from the effect of differing leakage, no explanation for this has been attempted. The problem is easily overcome, however, by using a supplementary calibration for paper capacitors in the microfarad range.

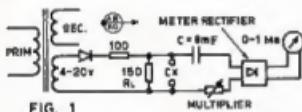


FIG. 1.—The Capacity Meter.

Values are not critical.  $C$  is needed to keep d.c. off the meter rectifier. Set meter to full scale by adjustment of the multiplier before connecting condenser under test. Choose a value for the multiplier which will allow f.s.d. with the voltages and meter available.

The concept of the tester is that it should be simple and cheap, should cover the range 5 to 200  $\mu$ F, provide a leakage test and allow measurements to be made without having to disconnect the suspect item.

Take any half wave a.c. to d.c. rectifier and apply the output to a load resistor. If there is no filter, there will be a substantial a.c. component across the load. A low range a.c. voltmeter can be coupled across the load and the multiplier set to give a full scale reading of the ripple. The more substantial the capacity subsequently placed across the load, the lower the meter reading of ripple. Calibration is then achieved by the simple expedient of recording meter readings against the labelled value of newish capacitors in series-parallel combinations to cover the preferred values in the range 0-200  $\mu$ F.

Since testing is incomplete unless we have an assurance that leakage is within reasonable limits, we also need to

provide an adjustable source of reasonably pure d.c., and a means of indicating within broad limits the amount of leakage. With low value mica/ceramic capacitors a conventional neon lamp is well proven, but with the higher leakage of electrolytics a less sensitive indication is needed. The meter used to display capacity can therefore be switched (and shunted as required) to read leakage.

There is considerable freedom in the way in which an appropriate test voltage can be obtained, ranging from a simple half wave supply with no choice of voltage; through a voltage doubler arrangement with switched voltage divider networks to provide precise ratings for test. However, with a 250 volt supply, providing a push to test switch is provided, a 2 watt 50K potentiometer can be calibrated to show the approximate voltage available for test. The ultimate choice depends mainly on the characteristics of the available transformer and the size of the instrument cabinet which is to be used.

In practice only one important refinement is needed to the simple capacity test circuit described above. If the capacitor under test, or the test leads are shorted, the output of the transformer rectifier will also be shorted. To avoid the smell of burning insulation, a series resistor of about 50-100 ohms must be used in series with the load resistor. Since both resistors will dissipate about 6 watts (depending on transformer voltage), it is necessary to use wire wound bias resistors together with a diode that will handle 60 mA. plus the peak charging current.

So far as the transformer secondary voltage is concerned, any voltage between 4 and 40 can be used, providing the series resistor is altered to maintain about 5 watts dissipation in the load, and that the meter multiplier is varied to permit full scale deflection with whatever end-voltage results. It is a slight advantage to have some portion of the meter multiplier adjustable from the front panel, so that the scale can be set before each set of readings of capacity.

The meter full scale deflection is not significant either, but the combination of a 6-12 volt transformer secondary and an 0-1 mA. meter has proved very satisfactory. Almost any available junk box combination can be fiddled into a satisfactory device. However, don't forget the low value blocking capacitor to keep d.c. off the meter rectifier.

After the instrument is completed, it is wise to measure the d.c. voltage across the load resistor, so that tests on small electrolytics of lesser working voltage can be avoided.

Calibration is not linear, but the difference between 5 and 8  $\mu$ F. can be seen easily. If the readings of newish electrolytics are graphed, it is a simple matter to extract scale readings corresponding with preferred values such as 8, 16, 25, 40, 50, 64, 100, 160  $\mu$ F. By using a parallel rheostat across the test capacitor, the value of in-circuit shunt resistance which will affect the accuracy of readings can be found. In general, a 1,500 ohm bias resistor across 25  $\mu$ F. will not affect the reading.

As with most test procedures, a few clues as to interpretation of results are sometimes needed. With this gadget—

- A shorted capacitor reads 200  $\mu$ F.
- A leaky capacitor shunts the ripple and consequently gives an erroneously high capacity reading. If the capacity reading is more than about 20% high on the labelled value—suspect a leaky capacitor and test further.
- Readings less than the labelled value are likely to be valid.
- A low voltage electro run at higher than rated d.c. voltage will initially show excessive capacitance, soon followed by a progressive drop to a low reading of capacity, probably accompanied by overheating.
- Paper capacitors although labelled the same value as electrolytics, do not produce the same scale reading.

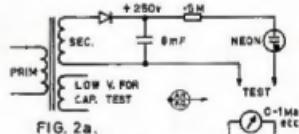


FIG. 2a.

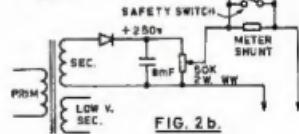


FIG. 2b.

FIG. 2a.—Simple Leakage Tester. For use with paper and mica capacitors. If electrolytics are to be tested frequently, it would be better to make provision for a meter indication of leakage as well.

FIG. 2b. Addition of a potentialmeter calibrated for voltage allows low voltage electro to be checked. The safety switch is needed as a precaution against high charging currents. A "normally closed" push button switch (such as is used for refrigerator lights) would be ideal. For clarity, switching has been omitted.

# HARMONICS

## LECTURE No. 10B

Now it is rather unfortunate that if we operate a valve in its most linear condition its efficiency is low, but luckily it is possible to operate under certain conditions with a considerable increase in efficiency whilst retaining low distortion characteristics.

Let us make some comparisons, taking data from an A.W.V. valve data book after detailing some definitions.

### CLASS OF SERVICE

#### Class A Amplifier

This is a valve amplifier in which the grid bias and the alternating grid voltages are such that plate current in a specific valve flows at all times.

The ideal class A amplifier is one in which the alternating component of the plate current is an exact reproduction of the form of the alternating voltage applied to the grid and plate current flows during the entire 360 degrees of the electrical cycle.

The characteristics of a class A amplifier are low output and low efficiency.

The efficiency of a class A amplifier may lie between 25% and 30%. One main characteristic is that grid current never flows during any part of the exciting voltage cycle.

In most valve type receivers the r.f. stages operate in class A. Also in the early days of radio telephony, using valves, the modulator valves were operated in class A.

#### Class AB Amplifier

An amplifier in which the grid bias and the applied alternating grid voltages are such that plate current in a specific valve flows for appreciably more than half but less than the entire electrical cycle.

The characteristics of a class AB amplifier are greater output and greater efficiency than a class A amplifier. However, the plate current will not remain steady. The bias is such that without an exciting voltage at the grid, the plate current will be lower than in class A operation and will rise considerably as the exciting voltage increases.

Class AB amplifiers are divided into two types known as AB1 and AB2.

In class AB1 amplifier grid current never flows during any portion of the grid excitation, but the efficiency is greater than in a class A amplifier.

But in class AB2 operation grid current does flow during part of the exciting voltage cycle and greater power can be obtained because the efficiency is still greater.

#### Class B Amplifier

An amplifier in which the grid bias is approximately equal to the plate current cut-off value so that plate current is approximately zero when no grid exciting voltage is applied, so that plate

- Continuing the series of lectures by C. A. Cullinan, VK3AXU, at Broadcast Station 3CS for students studying for a P.M.G. Radio Operator's Certificate.

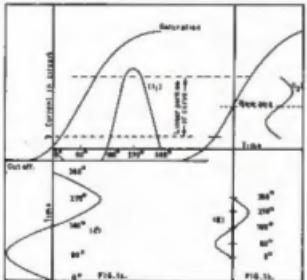
current in a specific valve flows for approximately one half of each cycle when an alternating voltage is applied to the grid.

The characteristics of a class B amplifier are high output and high efficiency (up to 78%).

However, there is a price to pay for this in that grid current may flow for almost the whole of the half cycle, the plate current without grid excitation is low but rises to a very high value with full excitation, hence the regulation of the driver amplifier and that of the power supply must be extra good.

The wave-form of such an amplifier would be generally similar to the current wave 12 in Fig. 1b, from the time axis upwards, with the top made to look more like a sine-wave.

Now as far as audio frequencies are concerned, the use of a single valve in class AB would not be of much use because of the serious distortion which would result (as per Fig. 1b), but, fortunately, there is a way out and that is by connecting two valves in what is known as push-pull.



In this connection one valve amplifies over one half of the exciting voltage cycle and the other valve amplifies over the other half cycle. (In an ideal amplifier.)

The plates of the two valves are connected to a load having the h.t. applied to the centre tap. Usually the load will take the form of a transformer having a centre-tapped primary, into which the actual load has been reflected.

If the two halves of the primary are well balanced as regards inductance, self-capacitance and resistance, then

C. A. CULLINAN,\* VK3AXU

the output of each valve will combine to produce a complete electrical cycle in the transformer, for each complete cycle of grid exciting voltage, also even-order harmonics (2nd, 4th, 6th, etc.) will cancel and in practice the even-order harmonics, particularly the 2nd, will be virtually non-existent, therefore it becomes possible to obtain good quality audio frequency power from class AB or class B operation. Also, push-pull operation may be applied to two valves in class A.

#### Class C Amplifier

This is an amplifier in which the grid bias is appreciably greater than the cut-off value so that the valve plate current is zero when no alternating grid voltage is applied, and so that the plate current in a specific valve flows for appreciably less than one half of each cycle when an alternating grid voltage is applied.

The characteristics of a class C amplifier are high plate circuit efficiency and high power output. However, as plate current flows only over portion of the grid voltage cycle there will be a considerable departure from linearity between the grid and plate wave-forms.

Class C amplifiers find their main use in radio frequency applications. For such purposes the valve operates into a tuned circuit, usually known as a 'tank circuit', and this has the property of appearing as a 'fly-wheel' converting the plate current pulses into a sine-wave usually with considerable harmonic content. Two valves used in class C operation in push-pull will have little even-order harmonic distortion due to the reduction of the even order harmonics because of the push-pull connection.

A similar state of affairs exists if a class B amplifier is operated at radio frequencies and it is possible to obtain excellent linearity if the valve and its associated circuits are correctly adjusted. Such an amplifier is often referred to as a linear amplifier.

Unfortunately a valve used as a class B radio frequency amplifier has low efficiency, about 33.3% and attempts to make it more efficient frequently cause considerable harmonic and intermodulation distortion.

Valve type 6L6 was developed before World War II, and has been a very popular valve. Although designed for audio frequency work, Radio Amateurs soon found that it was excellent at radio frequencies for transmitters, and later a variant called 607 was developed expressly for high power audio and radio frequency work.

To illustrate the operation of valves as amplifiers under the various classes of operation, we are listing some of those for 6L6 and 607s from the A.W.V. valve data books, 6L6G is a glass envelope equivalent of the 6L6.

**Type 6L6****Single Valve—Class A**

Plate voltage	250 v.
Screen voltage	250 v.
Grid voltage	-14 v.
Peak a.f. grid voltage	14 v.
Zero signal plate current	72 mA.
Max. signal plate current	78 mA.
Zero signal screen current	5 mA.
Max. signal screen current	7.3 mA.
Load resistance	2500 ohms
Max. signal power output	6.5 watts
Total harmonic distortion	10%

This valve is a tetrode and under class A operation there is a slight change in plate current. Grid current does not flow, however plate current flows at all times.

Note that there is a very high total harmonic distortion.

Let us compare what happens if two 6L6 valves are operated in class A push-pull for the same plate and screen voltages (for two valves).

Plate voltage	250 v.
Screen voltage	250 v.
Grid voltage	-16 v.
Peak grid to grid voltage	32 v.
Zero signal plate current	120 mA.
Max. signal plate current	140 mA.
Zero signal screen current	10 mA.
Max. signal screen current	16 mA.
Load resistance (pl. to pl.)	5000 ohms
Max. signal power output	14.5 watts
Total harmonic distortion	2%

Comparison of these two sets of data shows that the push-pull connection gives more than twice the output of a single valve, also that the total distortion has dropped to 2%.

By increasing both the plate and screen voltages as well as the grid bias, it is possible to operate two 6L6s in class AB1 push-pull and keep within the maximum ratings for the valves.

Here is one set of data for two valves.

**Class AB1**

Plate voltage	360 v.
Screen voltage	270 v.
Grid bias voltage	-22.5 v.
Peak a.f. grid to grid	45 v.
Zero signal plate current	88 mA.
Max. signal plate current	132 mA.
Zero signal screen current	5 mA.
Max. signal screen current	15 mA.
Load resistance (pl. to pl.)	5600 ohms
Max. signal power output	26.5 watts
Total harmonic distortion	2%

For this mode of operation there has been almost twice the power output as obtained from the same valves in class A push-pull, and the total harmonic distortion has remained the same. However, it must be pointed out that there is considerable variation in plate current and the screen voltage should be stabilized to keep it at 270 volts. Also, the regulation of the power supply must be very good to keep the h.t. voltage constant as the plate current swings from 88 mA. to 132 mA.

Grid current. Note that in all the examples given so far the peak grid exciting voltage does not exceed the bias voltage on either positive or negative peaks, hence grid current does not flow, nor is the valve driven beyond plate current cut-off.

**Class AB2**

Plate voltage	360	400 v.
Screen voltage	270	300 v.
Grid bias voltage	-22.5	-25 v.
Peak a.f. g-g. voltage	72	80 v.
Zero sig. plate current	88	102 mA.
Max. sig. plate current	205	230 mA.
Zero sig. screen current	5	5 mA.
Max. sig. screen curr't	11	20 mA.
Load resistance (plate to plate)	3800	3800 ohms
Max. sig. power output	44	60 watts
Total harm. distortion	3%	—
Peak grid pow. input	270	350 mW.

Two sets of operating conditions have been given. In the first set of data (A.W.V.) the major change from class AB1 operation is in the plate to plate load resistance. However, the grids are now driven into grid current on the positive peaks of the exciting grid voltage and as a result considerably more plate current flows.

However, there are penalties to be made good. The grids require 270 milliwatts of driving power, which means that the driver stage must have good regulation as it supplies this power. Also, the regulation of the plate and screen supplies must be very good.

The second set of data (R.C.A.) shows that with an increase in plate, screen and grid bias voltages and an increase in grid driving power up to 60 watts output can be obtained. However, no distortion figures are quoted.

It would appear that 47 watts output is the maximum that two 6L6 valves can deliver in class AB2 push-pull operation. Above this there is great danger of internal breakdown in the valves.

However, the 807 is essentially a 6L6 valve with different exterior appearance. The plate is brought out to a metal cap on the top of its glass envelope and the base uses a "low loss" UY configuration.

For Continuous Commercial Service (C.C.S.) the 807 may be operated with

the same ratings as for the 6L6, but for Intermittent Commercial and Amateur Service (I.C.A.S.) it is possible to get as much as 120 watts from two 807s in class AB2 push-pull operation.

No data is available for 6L6 or 807 valves for operation as class B audio frequency amplifiers.

All the data presented so far shows that class A operation is the least efficient, although the simplest, and that to obtain greater power from a specific valve it is necessary to use more than one valve in one of the other classes or several valves in parallel.

It is possible to operate in class A, AB1, AB2 and B so that the distortion in the output wave is very low, but the power output, too, will be low, also there is an enormous difference in the linearity between input and output wave forms for different types of valves.

**Important**—It must be thoroughly understood that data in valve handbooks refers to an ideal amplifier and such things as power output and distortion are those to be obtained at the valve or valves' plates. The output coupling device is not considered so in designing amplifiers the losses and any distortion in the coupling system must be taken into account.

It is possible to build valve amplifiers with nominally 1% total harmonic distortion and this can be reduced further if negative feedback is employed.

(to be continued)

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# Results of the 1970 Victorian 432 MHz. Antenna Gain Contest

By J. JENNINGS,\* VK3AVJ

Incorporated in the 1970 Victorian V.H.F. Convention held in Melbourne over the week-end of October 10 and 11 was a contest in which the gains of 432 MHz. antennas were measured.

The results are as follows:

	Submitted Gain
32 element extended- expanded collinear	VK3ZYQ 16
32 element extended- expanded collinear	VK3AOT 15
VK3ABP 15 element yagi	VK3AOT 11
12 over 12 skeleton slot	VK3ZTE 9
90° corner reflector	VK3AUI 8
VK3AGV 9 element yagi	VK3ZMU 7
Commercial 450 MHz. 7 over 7 skeleton slot	VK3AOT 5
11 element yagi	VK5ZDY 4
9 over 9 yagis	VK3ZCK 4
9 element yagi	VK3ZKB 2
7 over 7 skeleton slot	VK3AOT 2
Yagi	VK3AKC 1
Yagi	VK3ASV 1

The antenna with the lowest measured gain was a halo brought by VK-3ZBJ.

## MEASURING TECHNIQUE

The measuring technique used is illustrated in Fig. 1. At the beginning of each measurement a reference dipole was connected so as to receive the signal from a low power transmitter 300 ft. away. Receiver gain was adjusted for a convenient "S" meter reading with the variable attenuator in the 0 dB. position. The antenna under test was then connected in place of the reference dipole and the variable attenuator adjusted until the "S" meter reading corresponded with that for the dipole. Hence the antenna gain was read directly from the scale of the variable attenuator.

The variable attenuator used was calibrated for a 50 ohm source and load. To ensure that these conditions were met, 6 dB. pads were connected as shown in Fig. 1. Hence attenuator reading was made accurate almost regardless of antenna impedance and receiver input impedance.

Antenna gain measurements can also be effected by ground reflections. In theory results can be effected by between +6 dB. and -∞ dB., depending on the amplitude and phase difference between direct and reflected waves. It is believed that measures taken to reduce this source of error were effective since consistent results were obtained in several positions.

## EVALUATION OF RESULTS

It is believed that the technique used allowed gains to be compared to within  $\pm 1$  dB. The absolute error cannot be determined except by estimation.

Theoretical antenna gains can be most easily determined for the collinears and corner reflector. Measured results are about 2 dB. below theoretical, which indicates that the figures for all antennas measured may be 2 dB. low. This could be attributed to the mismatch existing between the 70 ohm reference dipole and the 50 ohm transmission line and to other deficiencies of the reference dipole.

Some antennas which exhibited reasonable directivity measured very low

in gain. This probably can be attributed to (1) poor surface conductivity of elements and other resistive losses, and (2) incorrect matching between antenna and 50 ohm transmission line. Mismatch is less of a problem in normal use since the tuning and loading controls of a final amplifier will usually cater for a wide range of load impedances. Such is not the case for a mismatched antenna delivering power into a line terminated in a 50 ohm pad.

(continued on page 18)

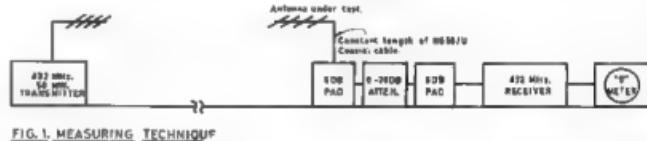


FIG. 1. MEASURING TECHNIQUE

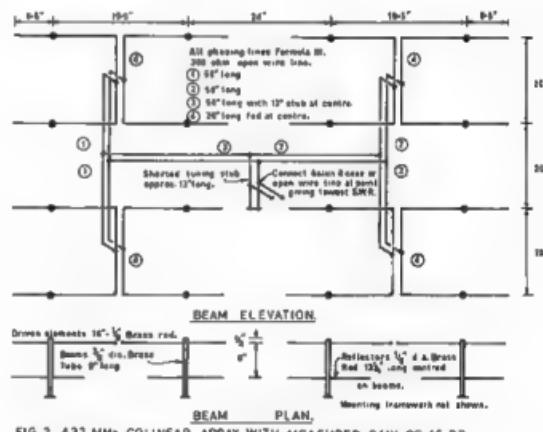


FIG. 2. 432 MHz. COLINEAR ARRAY WITH MEASURED GAIN OF 16 DB.

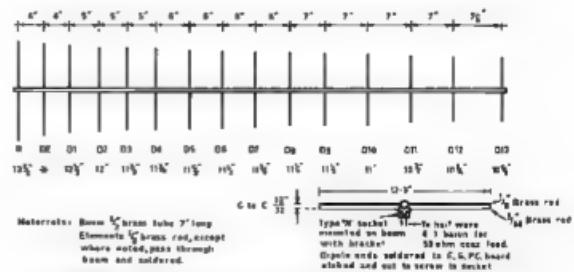


FIG. 3. 432 MHz. YAGI BASED ON DESIGN BY VK3ABP

# AUSTRALIAN DX CENTURY CLUB AWARD

## OBJECTS

- This Award was created in order to stimulate interest in working DX in Australia and to give successful applicants some tangible recognition of their achievements.
- This Award, to be known as the "DX Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.
- A certificate of the Award will be issued to the applicants who show proof of having contacted one hundred countries, and will be endorsed as necessary, for contacts made using only one type of emission.

## REQUIREMENTS

- Verifications are required from one hundred different countries as shown in the Official Countries List.
- The Official Countries List will be published annually in "Amateur Radio" and will be obtained from the W.I.A. as required. Should a country be deleted from the Countries List at any time, members and intending members will be credited with such country if the date of contact was before such deletion.
- The commencing date for the Award is 1st January, 1965. All contacts made on or after this date may be included.

## OPERATION

- Contacts must be made in the H.F. Band (Band 7) which extends from 3 to 30 MHz, but such contacts must only be made in the authorised Amateur Bands.
- All contacts must be two-way contacts on the same band. Cross-band contacts will not be allowed.
- Contacts may be made using any authorised type of emission for the band concerned.

3.4 Credit may only be claimed for contacts with stations using regularly-assigned Government call signs for the country concerned.

3.5 Contacts made with ship or aircraft stations will not be allowed, but land-mobile stations may be claimed provided their specific location at the time of contact is clearly shown on the verification.

3.6 All stations must be contacted from the same call area by the applicant (except as below), although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign provided the applicant is still in the same call area.

If the applicant moves to another call area, contacts must be made from within a radius of 150 miles of the previous location to qualify for award purposes. If the distance of the new location from the old exceeds a radius of 150 miles, a new application for a new award must be made claiming only contacts made from the new location.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

## VERIFICATIONS

- It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.
- Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the details for each claimed station in accordance with the details required in Rule 4.3.

## APPLICATIONS

5.1 Applications for membership shall be addressed to the Federal Awards Manager, W.I.A., P.O. Box 67, East Melbourne, Vic. 3002, accompanied by the verifications and check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of 25c, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the D.X.C.C. wishing to have their verified country totals over and above the one hundred required for membership, listed will be issued their totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

# AUSTRALIAN V.H.F. CENTURY CLUB AWARD

## OBJECTS

- This Award has been created in order to stimulate interest in the V.H.F. bands in Australia, and to give successful applicants some tangible recognition of their achievements.

1.2 This Award, to be known as the "V.H.F. Century Club" Award, will be issued to any Australian Amateur who satisfies the following conditions.

1.3 Certificates of the Award will be issued to the applicants who show proof of having made one hundred contacts on the V.H.F. bands, and will be endorsed as necessary, for contacts made using only one type of emission.

## REQUIREMENTS

- Contacts must be made in the V.H.F. Band (Band 8) which extends from 30 to 300 MHz, but such contacts must only be made in the authorised Amateur Bands in Band 8.

2.3 In the case of the authorised bands between 30 and 100 MHz, verifications are required from one hundred different stations at least seventy of which must be Australian. The Amateur Bands 50 to 54 MHz, and 55 to 60 MHz, will be counted as one band for the purposes of the Award.

2.3 In the case of the authorised Amateur Band between 100 to 200 MHz, verifications from one hundred different stations are required.

2.4 It is permissible under these rules for one applicant to receive two certificates, one for each of the authorised Amateur Bands nominated in Rules 2.3 and 3.3.

2.5 The commencing date for the Award is 1st June, 1965. All contacts made on or after this date may be included.

## OPERATION

3.1 All contacts must be two-way contacts on the same band, and cross-band contacts will not be allowed.

3.2 Contacts may be made using any authorised type of emission for the band concerned.

3.3 Fixed stations may contact portable/mobile stations and vice versa, but portable/mobile station applicants must make their contacts from within the same call area.

3.4 Applicants, when operating either portable/mobile or fixed, may contact the same station licensee, but may not include both contacts for the same type of endorsement.

3.5 Applicants may only count one contact for a station worked as a limited licensee with a call sign that is subsequently contacted as a full A.O.C.P. holder.

3.6 All stations must be contacted from the same call area by the applicant (except as below), although if the applicant's call sign is subsequently changed, contacts will be allowed under the new call sign provided the applicant is still in the same call area.

If the applicant moves to another call area, contacts must be made from within a radius of 150 miles of the previous location to qualify for award purposes. If the distance of the new location from the old exceeds a radius of 150 miles, a new application for a new award must be made claiming only contacts made from the new location.

3.7 All contacts must be made when operating in accordance with the Regulations laid down in the "Handbook for the Guidance of Operators of Amateur Wireless Stations" or its successor.

## VERIFICATIONS

4.1 It will be necessary for the applicant to produce verifications in the form of QSL cards or other written evidence showing that two-way contacts have taken place.

4.2 Each verification submitted must be exactly as received from the station contacted, and altered or forged verifications will be grounds for disqualification of the applicant.

4.3 Each verification submitted must show the date and time of contact, type of emission and frequency band used, the report and the location or address of the station at the time of contact.

4.4 A check list must accompany every application setting out the following details:

4.4.1 Applicant's name and call sign, and whether a member of the W.I.A. or not.

4.4.2 Band for which application is made, and whether special endorsement is involved.

4.4.3 Where applicable, the date of change of call sign and previous call sign.

4.4.4 Details of each contact as required by Rule 4.3.

4.4.5 The applicant's location at the time of each contact if portable/mobile operation involved.

4.4.6 Any relevant details of any contact about which some doubt might exist.

## APPLICATIONS

5.1 Applications for membership shall be addressed to the Federal Awards Manager, W.I.A., P.O. Box 67, East Melbourne, Vic. 3002, accompanied by the verifications and check list with sufficient postage enclosed for their return to the applicant, registration being included if desired.

5.2 A nominal charge of 25c, which shall also be forwarded with the application, will be made for the issue of the certificate to successful applicants who are non-members of the Wireless Institute of Australia.

5.3 Successful applicants will be listed periodically in "Amateur Radio". Members of the V.H.F.C.C. wishing to have their verified country totals over and above the one hundred required for membership, listed will be issued their totals to the Federal Awards Manager.

5.4 In all cases of dispute, the decision of the Federal Awards Manager and two officers of the Federal Executive of the W.I.A. in the interpretation and application of these Rules shall be final and binding.

5.5 Notwithstanding anything to the contrary in these Rules, the Federal Council of the W.I.A. reserves the right to amend them when necessary.

# AUSTRALIAN D.X.C.C. COUNTRIES LIST

Phone	C.W.	Phone	C.W.
A2C, ZS8 Botswana		FR7—Tromelin	
AC3—Sikkim		FS7—Saint Martin	
AC4—Tibet		FW8—Wallis and Futuna Is.	
AC5—Bhutan		FY7—French Guiana and Inini	
AP—East Pakistan		G, GB—England	
AP—West Pakistan		GC—Guernsey and Dependencies	
BV—Taiwan		GC—Jersey Is.	
BY—China		GD—Isle of Man	
C21, VK8—Nauru		GI—Northern Ireland	
C31, PX—Andorra		GM—Scotland	
CE—Chile		GW—Wales	
CE9AA—AM, F8SY, KC4AA-US, LA, LU-Z, OR, UAI, VK0, VP8, ZLS, 8J—Antarctica		HA, HG—Hungary	
CE0A—Easter Is.		HB8—Switzerland	
CE0X—San Felix		HB0—Liechtenstein	
CE0Z—Juan Fernandez		HC—Ecuador	
CM, CO—Cuba		HC6—Galapagos Is.	
CN—Morocco		HH—Haiti	
CP—Bolivia		HI—Dominican Republic	
CR3—Portuguese Guinea		HK—Columbia	
CR4—Cape Verde Is.		HK0—Bajo Nuevo	
CR5—Principe, Sao Thome		HK0—Malpelo Is.	
CR6—Angola		HK0—Sr Andres and Providencia	
CR7—Mozambique		HL, HM—Korea	
CR8—Portuguese Timor		HP—Panama	
CR9—Macao		HR—Honduras	
CT1—Portugal		HS—Thailand	
CT2—Azores		HV—Vatican	
CT3—Madeira		HZ, 7Z—Saudi Arabia	
CX—Uruguay		I, IT—Italy	
DJ, DK, DL, DM—Germany		IS1—Sardinia	
DU—Philippine Is.		JA, JH, JR, KA—Japan	
EA—Spain		JD1, KA1, KG6I—Bonin and Volcano Is.	
EA6—Balearic Is.		JD1, KA1, KG6I—Marcus Is.	
EA8—Canary Is.		JT—Mongolia	
EA9—Rio de Oro		JW—Svalbard	
EA9—Spanish Morocco		JX—Jan Mayen	
EI—Republic of Ireland		JY—Jordan	
EL—Liberia		K, KN, W, WA, WB, WN—United States	
EP—Iran		of America	
ET3—Ethiopia		KB6—Baker, Howland and American	
F—France		Phoenix Is.	
FBBW—Crozet Is.		KC4—Navassa Is.	
FBBX—Kerguelen Is.		KC6—Eastern Caroline Is.	
FBSZ—Amsterdam and St. Paul Is.		KC6—Western Caroline Is.	
FC—Corsica		KG4—Guantanamo Bay	
FG7—Guadeloupe		KC6—Guam	
FH8—Comoro Is.		KG6—Mariana Is.	
FK8—New Caledonia		KH6, WH6—Hawaiian Is.	
FL8—French Somaliland		KH6—Kure Is.	
FM7—Martinique		KJ6—Johnston Is.	
FO8—Clipperton Is.		KL7, WL7—Alaska	
FO8—French Oceania		KM6—Midway Is.	
FO8M—Maria Theresa		KP4, WP4—Puerto Rico	
FP8—St. Pierre and Miquelon		KP6—Palmyra Group, Jarvis Is.	
FR7—Glorioso Is.		KR6, 8—Ryuku Is.	
FR7—Juan de Nova		KS4—Swan Is.	
FR7—Reunion Is.		KS4B, HK0—Serrana Bank and Ron-	
		cador Cay	
		KS6—American Samoa	

	Phone	C.W.		Phone	C.W.
KV4, WV4—Virgin Is.			UJ8—Tažhik		
KW8—Wake Is.			UL7—Kazakh		
KX6—Marshall Is.			UM8—Kirghiz		
KZ5—Canal Zone			UO6—Moldavia		
LA, LJ—Norway			UP2—Lithuanian		
LU—Argentina			UQ2—Latvia		
LX—Luxembourg			UR2—Estonia		
LZ—Bulgaria			VE, VO—Canada		
MP4B—Bahrein			VK—Australia		
MP4D, T—Trucial Oman			VK2—Lord Howe Is.		
MP4M—Sultunate of Muscat and Oman			VK4—Willis Is.		
MP4Q—Qatar			VK8—Christmas Is.		
OA—Peru			VK9—Cocos Is.		
OD5—Lebanon			VK9—Norfolk Is.		
OE—Austria			VK9—Papua Territory		
OH—Finland			VK9—Territory of New Guinea		
OH0—Aland Is.			VK0—Heard Is.		
OJ0—Market Reef			VK0—Macquarie Is.		
OK, OL—Czechoslovakia			VP1—British Honduras		
ON—Belgium			VP2A—Antigua, Barbuda		
OX, KG1, XP—Greenland			VP2D—Dominica		
OY—Faroe Is.			VP2E—Anguilla		
OZ—Denmark			VP2G—Grenada and Dependencies		
PA, PE, PI—Netherlands			VP2K—St. Kitts, Nevis		
PJ—Netherlands Antilles			VP2L—St. Lucia		
PJ—Sint Maarten			VP2M—Montserrat		
PY—Brazil			VP2S—St. Vincent and Dependencies		
PY0—Fernando de Noronha			VP2V—British Virgin Is.		
PY0—St. Peter and St. Paul's Rocks			VP5—Turks and Caicos Is.		
PY0—Trindade and Martim Vaz Is.			VP7—Bahama Is.		
PZ1—Surinam			VP8—Falkland Is.		
SK, SL, SM—Sweden			VP8, LU-Z—South Georgia Is.		
SP—Poland			VP8, LU-Z—South Orkney Is.		
ST—Sudan			VP8, LU-Z—South Sandwich Is.		
SU—Egypt			VP6, LU-Z, CEAN-AZ—South Shet-		
SV—Crete			land Is.		
SV—Dodecanese			VP9—Bermuda Is.		
SV—Greece			VQ1—Zanzibar		
TA, TC—Turkey			VQ9—Aldabra Is.		
TF—Iceland			VQ9—Chagos Is.		
TG—Guatemala			VQ0—Desroches		
TI—Costa Rica			VQ9—Farquahar		
TI9—Cocos Is.			VQ9—Seychelles		
TJ—Cameroun			VR1—British Phoenix Is.		
TL—Central African Republic			VR1—Gilbert, Ellice and Ocean Is.		
TN—Congo Republic			VR2—Fiji Is.		
TR—Gabon Republic			VR3—Fanning and Christmas Is.		
TT—Chad Republic			VR4—Solomon Is.		
TU—Ivory Coast			VR5—Tonga Is.		
TY—Dahomey Republic			VR6—Pitcairn Is.		
TZ—Mali Republic			VSS—Brunei		
UA, UV, UW1-6, UNI—European Rus-			VS6—Hong Kong		
sian S.F.S.R.			VS9K—Kamaran Is.		
UA, UV, UW8, 0—Asiatic R.S.F.S.R.			VU—India		
UA1—Franz Josef Land			VU—Laccadive Is.		
UA2—Kalininogradsk			VU—Andaman and Nicobar Is.		
UB5, UT5, UY5—Ukraine			XE, XF—Mexico		
UC2—White Russian S.S.R.			XF4—Revilla Gigedo		
UD6—Azerbaijan			XT2—Voltaic Republic		
UF8—Georgia			XU—Cambodia		
UG6—Armenia			XW8—Laos		
UH8—Turkoman			XZ2—Burma		
UI8—Uzbek			YA—Afghanistan		

	Phone	C.W.	Phone	C.W.
YB, YC, YD, 8F—Indonesia			7X, FA—Algeria	
YL—Iraq			8P—Barbados	
YJ—New Hebrides			8QA, VS9M—Maldivian Is.	
YK—Syria			8R—Guyana	
YN—Nicaragua			8Z4—Saudi Arabia/Iraq Neutral Zone	
YO—Romania			8A1, MI—San Marino	
YS—El Salvador			9G1—Ghana	
YU—Yugoslavia			9H1—Malta	
YY—Venezuela			9J—Zambia	
YV0—Aves Is.			9K2—Kuwait	
ZA—Albania			9K3, 8Z5—Kuwait/Saudi Arabia Neutral Zone	
ZB2—Gibraltar			9L1—Sierra Leone	
ZD3—The Gambia			9M2, 4—Western Malaysia (fr. 16/9/63)	
ZD5—Swaziland			9M6, 8—Eastern Malaysia (fr. 16/9/63)	
ZD7—St. Helena			9N1—Nepal	
ZD8—Ascension Is.			9Q5—Republic of the Congo	
ZD9—Tristan da Cunha & Gough Is.			9U5—Burundi	
ZE—Rhodesia			9V1, VS1, 9M4—Singapore (prior to 16/9/63 or after 8/8/65 only. From 16/9/63 to 8/8/65 Singapore counts as 9M2—West Malaysia)	
ZF1—Cayman Is.			9X5—Rwanda	
ZK1—Cook Is.			9Y4—Trinidad and Tobago	
ZK1—Manahiki Is.			*—Blenheim Reef	
ZK2—Niue			*—Geyser Reef	
ZL—New Zealand				
ZL/A—Auckland and Campbell Is.				
ZL/C—Chatham Is.				
ZL/K—Kermadec Is.				
ZM7—Tokelau				
ZP—Paraguay				
ZS1—South Africa				
ZS2—Prince Edward and Marion Is.				
ZS3—South-West Africa				
1M—Minerva Reefs				
1S—Spratly Is.				
3A—Monaco				
3B6, 7, VQ8—Agalega and St. Brandon				
3B8, VQ8—Mauritius				
3B9, VQ8—Rodriguez				
3C, EA0—Equatorial Guinea				
3V8—Tunisia				
3W8, XV5—Vietnam				
3Y—Bouvet Is.				
4S7—Ceylon				
4U1—I.T.U. Hq. Geneva				
4W—Yemen				
4X4, 4Z4—Israel				
5A—Libya				
5B4, ZC4—Cyprus				
5H3—Tanzania				
5N2—Nigeria				
5R8—Malagasy Republic				
5T—Mauritania				
5U7—Niger Republic				
5V—Togo Republic				
5W1—Samoa				
5X5—Uganda				
5Z4—Kenya				
6O1, 2, 6—Somali Republic				
6W8—Senegal Republic				
6Y5—Jamaica				
7G1—Republic of Guinea				
7O, VS8—South Yemen Republic				
7P8—Lesotho				
7Q7—Malawi				

\* Since there is no apparent claim by any country to these reefs, no prefix will be shown. Confirmations for contact only after 4/5/67 will be accepted for D.X.C.C. credit.

#### DELETED COUNTRIES LIST

	Phone	C.W.
C9—Manchuria (prior 16/9/63)		
CN2—Tangier (prior 1/7/60)		
CR6—Damao, Diu (prior 1/1/62)		
CR8—Goa (prior 1/1/62)		
EA9—Ifni (prior 13/5/69)		
ET2—Eritrea (prior 15/11/62)		
FF6—French West Africa (pr. 7/8/60)		
FI8—French Indo China (pr. 21/12/50)		
FN—French India (prior 1/11/54)		
FQ8—French Equ. Africa (pr. 17/8/60)		
II—Trieste (prior 1/4/57)		
IS—Italian Somaliland (prior 1/7/60)		
JZ0—Nether. New Guinea (pr. 1/5/63)		
PK1, 2, 3—Java (prior 1/5/63)		
PK4—Sumatra (prior 1/5/63)		
PK5—Netherlands Borneo (pr. 1/5/63)		
PK6—Celebes & Moluc. Is. (pr. 1/5/63)		
UN1—Karelo-Finnish Rep. (pr. 1/7/60)		
VO—Newfoundland (prior 1/4/49)		
VQ6—Brit. Somaliland (prior 1/7/60)		
VS4—Sarawak (prior 16/9/63)		
VS9H—Kuria Muria Is. (pr. 29/11/67)		
ZC5—Brit. North Borneo (pr. 16/9/63)		
ZC6—Palestine (prior 2/7/68)		
ZD4—Gold Coast, Togol'd (pr. 8/3/57)		
9M2—Malaya (prior 16/9/63)		
9S4—Sar (prior 1/4/57)		
9U5—Ruanda-Urundi (between 1/7/60 and 1/7/62 only)		

# AMSAT 1970 ANNUAL REPORT

By DR. PERRY I. KLEIN,\* K3JTE, President

On March 3, AMSAT reached its first anniversary of incorporation and entered its second year of activity. Membership grew from 364 members and 11 member clubs on January 1, 1969, to 3700 members and 25 member clubs in 26 countries. The following compares the second annual report presented at the AMSAT annual meeting, held on November 21, 1970.

## ACCOMPLISHMENTS TO DATE

### AUSTRALIA OSCAR 5

This first full year of AMSAT's operation witnessed the launch of the fifth Radio Amateur satellite of the Oscar series, Australia Oscar 5 (AO-5), built by the WIA Project Australia group in Australia, with launch from the Western Test Range, Calif., on Jan. 25, 1970. The spacecraft's two metre beacon transmitter operated for 33 days, and its commandable ten metre beacon transmitter reached end of life after 18 days.

The AO-5 mission was technologically significant in several respects. Of particular significance was the command system which was used to control the operation of the ten metre beacon. Commands were successfully transmitted by stations in Australia and the United States, marking the first time that successful operation of a command system has been demonstrated in a satellite in the Amateur Service.

The passive magnetic attitude stabilization system employed in AO-5 was also very successful. The bar magnet and eddy-current damper brought one axis of the spacecraft into alignment with the earth's magnetic field within a few days of launch. The rapid stabilization was indicative of the effectiveness of this method of reducing the spin in Amateur satellites.

AO-5 was the first satellite in the Amateur Service to receive and store data from Earth. Many reception reports of the 29.45 MHz ten metre beacon were received from Amateurs and SWL's using simple long-wire or dipole antennas. Reports of skip propagation and antigenic reception were reported by a number of observers.

Reports were received from several hundred stations in at least 27 countries, including the Soviet Union. All telemetry reports were forwarded to WIA Project Australia for analysis, for propagation and QSL acknowledgments. Reports from I.A.R.U. Region 1 Amateurs were collected and handled by Bill Browning, G3AOX, Region 1 Oscar Coordinator.

The results of the AO-5 project are contained in the "AO-5 Summary Report" submitted June 9 to the FCC and NASA, and reprinted in the June 1970 issue of the "AMSAT Newsletter." Two other reports, one dealing with the propagation results and the other dealing with the spacecraft telemetry results, were also submitted to FCC and NASA, and appear in the October and December 1970 issues of "Spaceflight," respectively.

### ATS-G EXPERIMENTAL PROPOSAL

In November 1969, AMSAT submitted a proposal to NASA to provide two Amateur experiments for the NASA Applications Technology Satellite G (ATS-G) synchronous satellite. The first experiment proposed was an experimental channelized repeater which would receive signals in the two metre band and re-transmit them in the 70 centimetre band. The second experiment proposed the transmission of television pictures in the 70 centimetre band. Both experiments would take advantage of the 30-foot parabolic antenna on the ATS-G spacecraft and ATS-G's synchronous ("stationary") orbit.

The NASA request, an addendum to the proposal, was accepted and submitted on January 2, 1970, dealing with the choice of frequency bands proposed and the question of the possibility of interference to and from other services. On January 23, again at NASA invitation, AMSAT gave an oral presentation of the proposal before a NASA advisory committee evaluating the ATS-G experiments.

### WORLD ADMINISTRATIVE RADIO CONFERENCE PREPARATIONS

In preparation for the June 1971 World Administrative Radio Conference on Space Matters, which will be dealing with the allocation of frequencies for Amateur satellites, AMSAT

prepared two documents for the ITU's International Radio Consultative Committee (CCIR). One is a report entitled "Technical Feasibility of Frequency Sharing in the Amateur Communication Service," and the other is a recommendation on the same subject. Both documents were approved by the U.S. CCIR National Committee for forwarding to the other ITU member countries. AMSAT also assisted ARRL in preparing material to the FCC on frequency requirements for future Amateur satellites. The text of one filing to the Commission is reprinted in the August issue of "QST."

### AMSAT ADDRESSES AND PRESENTATIONS

In conjunction with the Sept. 25-27, 1970, National Convention held in Boston, Sept. 27, AMSAT sponsored the first "Radio Amateur Satellite Conference," with sessions presenting the results of AO-5 and plans for future satellite projects. Addresses were given at several other Amateur gatherings, including the Dayton Hamvention, the Roanoke Division Convention in Roanoke, Virginia, and the National States VHF Society conventions, and a number of radio club meetings. An AMSAT paper entitled "Radio Amateur Satellites for Education and Research" was presented at the 1970 IEEE Broadcasters and Antennas Systems Conference held in Washington in October.

### CURRENT ACTIVITY— AMSAT-OSCAR B

Work is progressing on AMSAT-Oscar B (AO-B), the first of a series of long lifetime Amateur communications satellites designed for launch as secondary payloads on Thor-Deltas or Agave missiles. A detailed specification for the first Oscar B satellite has been prepared in April and distributed as guidance material for persons indicating a serious interest in developing experiments for these satellites. There are now several experiments under development.

A four-channel, channelized, hard-limiting FM repeater is being breadboarded by members of WIA Project Australia who had been involved in the construction of Australia Oscar 5. The repeater is a linear repeater with a remodulation type and employs a frequency of approximately 145.9 MHz for the uplink and 432.1 MHz for the downlink, with a satellite transmitter power output of one watt per channel.

A linear repeater with a bandwidth of 50 MHz is under construction by the Euro-Oscar group in Marbach, West Germany. This repeater has an input frequency of 432.1 MHz and an output frequency of 145.9 MHz, with a satellite transmitter power output of ten watts. The repeater is designed for use with SSB CW, AM FM RTTY or SSTV, with as many stations as can fit within its 50 KHz bandwidth.

Also being breadboarded is a linear repeater under construction by AMSAT members in the United States. This repeater has an input frequency of 145.9 MHz, and an output frequency of 432.1 MHz, with a satellite transmitter power output of one watt. The repeater will be capable of being used with any method of modulation permitted in these two bands.

The WIA Project Australia group has developed an Oscar telemetry encoder which transmits telemetered satellite parameters directly in 850 Hz audio frequency-shift keyed teletype format, for printout on an ordinary wire-line teletype. Any station having a tape recorder will be able to send or re-transmit the received data directly to AMSAT headquarters for computer processing, or they may decode the telemetry data themselves using calibration information which will be made available prior to launch.

John Goode, W5CAY, has designed and breadboarded an Oscar telemetry encoder which transmits satellite telemetered parameters directly in a binary Code so that only serial, parallel, calibration information are needed for reception and interpretation of data from the satellite.

A breadboard of a command encoder capable of providing up to 35 separate command functions has been completed by the WIA Project Australia group. The command encoder is designed to provide a reliable and secure means of controlling the emissions of Oscar satellites to minimize any possibility of interference.

Several panels of solar cells left over from NASA and ESSA satellite programmes have been made available for use in the A-O-B. A number of solar panels of these are being reconfigured for use in A-O-B. Rechargeable nickel cadmium batteries have also been made available and have been undergoing charge-discharge cycle testing under simulated use and power loads. The solar cells and rechargeable batteries are expected to make possible satellite operating lifetimes in excess of one year.

Following designs prepared by AMSAT's A-O-B Project, the first A-O-B satellite assembly and experiment modules have been fabricated at the facilities of W5CAY in Ithaca, New York. This is actual flight hardware, and represents the beginning of construction of the A-O-B space craft.

An AMSAT proposal to NASA for the launch of AMSAT-Oscar-B was submitted in August and an oral presentation was given in November. A copy of the proposal and justification material included in the proposal was reprinted in the Sept. issue of the "AMSAT Newsletter".

In connection with the A-O-B satellite project, a co-operative agreement has been arranged between Australia and the United States to permit the exchange of third-party Amateurs in connection with the satellite. This agreement extends the previous AO-5 third-party agreement arranged last year until several months after the end of life of Oscar 5.

### FUTURE ACTIVITY

AMSAT is giving highest priority to the development of long-lifetime solar-powered Oscar satellites that can be used regularly and reliably to augment Amateur communications, particularly on the VHF Amateur bands. Thus the development of the Oscar B satellite, beginning with A-O-B, will open the door to the international use of Amateur satellites as an additional mode of communications for Amateur Radio.

★

### CHANGE IN INTRUDER WATCH COORDINATOR IN N.S.W.

Bill Jevney, VK2EZO, has been appointed Intruder Watch Coordinator for New South Wales in place of Ross Treiter, who has been forced to retire due to overseas work commitments.

Bill Jevney's (VK2EZO) address is 9 Forsyth Street, Willoughby, N.S.W., 2068.

### A & R-SOANAR 25th ANNIVERSARY

Now one of Australia's leading components and electronic manufacturers and distributors, the A & R-Soanar Group of Companies are currently celebrating 25 years in business.

During the last five years, A & R diversified their manufacturing activities by developing a range of electronic and electrical equipment, specializing in consumer, communications, educational and laboratory apparatus, and consumer electronic products.

A variety of air-cooled transformers from sub-miniature to 10KVA have been developed as a result of this.

The scope of activity by the Group runs into many millions of dollars a year, with offices in three States, employing approximately 300 people in the manufacture and merchandising of a wide range of electronic components, with the consolidation of offices and plant at Box Hill, buildings now embracing over 35,000 square feet of space.

A continual research and development programme involving two groups of engineers and scientific staff, are in the forefront of overall plans for further expansion to keep pace with industry and to meet future requirements from industry, consumer and government departments.

By early 1971, a Tokyo office will be established to meet the expanded activities of Soanar Electronics and to provide improved availability of capacitors, resistors and other components.

The A & R-Soanar Group, with 25 years operational success behind them, look forward to the next 25 years with excitement and optimism, as part of Australia's fastest growing industry.

## THE CALL BOOK

The 1971 issue of the Call Book is now in the course of preparation. The schedule we are working to means that the book will be available some time during April, and will include all alterations and additions as notified to us by the P.M.G.'s Department up to and including the December 1970 lists.

In previous years, we have received some severe criticism over errors that have appeared in the Call Book, but our experience has shown that the errors which have occurred have been due to the fact that many licensees have failed to notify the Department when there has been a change of address, despite the fact that any such change of station location can (according to the regulations) only be made with the permission of the Department. The fact that this regulation is not strictly enforced in no way relieves the licensee of his responsibility of making sure that his address is correctly advised to the proper authorities.

In an endeavour to produce the most up-to-date Call Book possible, we will notify the Department of any changes of address of which we are aware, but have not appeared in any official Departmental lists up to December 1970.

### LICENSED AMATEURS IN VK AT AUGUST 1970

	Full	Limited	Total
VK0	7	0	7
VK1	83	28	111
VK2	1401	457	1858
VK3	1294	635	1929
VK4	527	194	721
VK5	516	233	749
VK6	356	140	496
VK7	160	72	232
VK8	31	10	41
VK9	84	8	92
	4459	1777	6236
			Grand Total



Brian Armstrong, G3EDD, Executive Vice-President of R.S.G.B. recently visited Melbourne. Les Jenkins, VK3BZJ, Project Manager of W.I.A. Project Australis Group, is showing Brian a 432 MHz transceiver. On the left is W.I.A. Federal President Michael Owen, VK3KI

## Results of 432 MHz. Aerial Gain Contest

(continued from page 18)

### COLINEAR DESIGN

The two antennas exhibiting highest gain (15 and 16 dB, respectively) were 32 element extended-expanded colinears. These antennas originated in the San Francisco Bay area of California and have become increasingly popular in the United States. The lengths of the driven elements are extended to 5/8 of a wavelength and the spacing between parallel elements expanded to 3/4 of a wavelength. In conventional colinears these dimensions are both 1/2 wavelength. The detailed dimensions are given in Fig. 2.

### YAGI DESIGN

The most successful yagi (11 dB) was based on the highly reputed VK3ABP design, the dimensions of which are given in Fig. 3.

### CONCLUSION

It is expected that the antenna gain measurement will become an annual event, thus providing Amateurs in the Eastern States with a means of evaluating their antennas and determining trends in antenna design.

### W.I.A. D.X.C.C.

Listed below are the highest twelve members in each section. Position in the list is determined by the first number shown. The first number represents the participant's total countries less any credits given for deleted countries. The second number represents the total D.X.C.C. credits given, including deleted countries. Where totals are the same, listings will be alphabetical by call sign.

Credit for new members and those whose totals have been amended are also shown.

#### PHONE

VK3MS	218/343	VK3AB	257/314
VK3AM	218/343	VK3AB	257/314
VK4HR	215/323	VK3TY	255/309
VK3AO	211/328	VK3APK	251/311
VK6MK	304/324	VK3AAK	272/377
VK4KS	300/315	VK3TL	271/371

#### Amendments:

VK4PK	251/352	VK3JW	254/326
VK3AM	227/327	VK3RF	192/192

#### Corrections:

VK3AM	shows in the Nov. 1970 list as Cert. No. 113, should read Cert. No. 114.
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#### C.W.

VK3RQJ	305/320	VK3YJ	279/286
VK3A3H	301/315	VK3NC	274/309
VK3A3H	301/315	VK3V	274/309
VK3HR	289/311	VK3ARX	270/376
VK3AGH	223/306	VK3RHU	268/358
VK3APK	280/328	VK3TY	259/372

#### Amendments:

VK4RF	189/181	VK3PK	107/111
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#### OPEN

VK3RJU	218/343	VK3MK	304/324
VK3HR	211/341	VK3EO	274/309
VK3A3H	314/334	VK4KS	301/325
VK3VN	219/328	VK3APK	298/305
VK4SD	306/321	VK3JF	268/323
VK3TY	308/321	VK3A3H	297/309

#### Amendments:

VK4PK	262/262	VK3HD	191/191
VK3ARF	235/247		

#### New Member:

Cert. No.	Call	Total
180	VK3JK	128/136

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OTL

# NEW CALL SIGNS

AUGUST 1970

VK5DA—A Davis, 49 Duigan St., Seville, 2514.  
 VK5GY—G E Smith, 22 Glynn St., Farringdon, 2807.  
 VK5IJK—L. Daniell, 4 Bandjalong Cres., Aranda, 2608.  
 VK5LW—L M Stone, Lot 10, Trafalgar Rd., Tuggeranong, 2627.  
 VK5WL—E W Bustow, 31 Esolina St., Colyaroy Pines, 2066.  
 VK5RADX—S. A. Mann, 9 Birubi Ave., Pymble, 2073.  
 VK5AHL—G B Moss, 16 Montreal Ave., Killara, 2071.  
 VK5ALK—B W Smeaton, 91 Carina Rd., Oyster Bay, 2225.  
 VK5AIP—R. Dennis, 21 Leichhardt St., Leichhardt, 2040.  
 VK5ATC—R. H. Iwasenko, 3 Rosedale St., Canley Heights, 2188.  
 VK5ATR—P. R. Lorenzen, 21 Fennell St., Backwell Park, 2283.  
 VK5AVY—G. A. Tritter, 565 Buchhorn St., St. Leonards, 2065.  
 VK5AYS—R. J. Irving, 7 Lens Pl., Merrylands, 2166.  
 VK5BKA—G D Hoskins, 24 Lucinda Ave., Wetherill Park, 2076.  
 VK5BKB—R. G. Day, 73 Ranelagh St., Boroondara, 2244.  
 VK5BBD—N. L. Kinch, 9/12-18 Morwick St., Strathfield, 2135.  
 VK5BIV—H. M. Smith, 11 Clarke St., Lithgow, 2790.  
 VK5BNI—P. T. Nicholson, 89 Copeland Rd., Bexley, 2118.  
 VK5BRR—F. L. Halton, Wentworth Hotel, Sydney, 2000.  
 VK5EII—D. Wilson, 25 Swift St., Port Macquarie, 2444.  
 VK5EKW—A. A. Wallis, 84 Combined St., Wingham, 2420.  
 VK5ZLN—L A Davies, 90 Cambridge St., St. Leonards, 2065.  
 VK5ZZZ—D. W. Fritsch, "Weidson," Old Northern Rd., Dural, 2188.  
 VK5IANA—P. W. Colice, 199 Mackie Rd., East Bentleigh, 3166.  
 VK5AWG—A.C.I. Electronics Radio Club, 310-322 Ferntree Gully Rd., Clayton North, 3168.  
 VK5BEM—E. Cabena, 2 Stirling St., Kew, 3101.  
 VK5BRT—Box Hill Boys' Technical School Radio Club, Box Hill Boys' Technical School, Dunlop Ave., Box Hill, 3128.  
 VK5BSA—John College Radio Club, 204 Churchill Ave., Straybrook, 3012.  
 VK5YAX—R. E. Burgess, 49 Canberra St., Mos, 3820.  
 VK5YEB—A. J. Cartwright, 38 Rose St., Highett, 3190.  
 VK5YEH—S. Myne, 11/14 Auburn Rd., Hawthorn, 3128.

VK4BC—W F Bennett, 351 East St., Rockhampton, 4700.  
 VK4MM—W C Mitchell, Station Cr. Coe's Creek Rd. and Glynn St., Namboor, 4560, Postal: P.O. Box 368, Namboor, 4560.  
 VK4RP—W. J. Macaulay, 25 Parkmore St., Boondall, 4006.  
 VK5AS—A. P. Jordan, 94 Allings Ave., Glenwood, 2065.  
 VK5AT—R. J. Courten, 17/3 Phillips Hwy., Elizabeth, 5113.  
 VK5IJ—J. J. Pischnick, 15 Bringalow Ave., Seaview Gardens, 5047.  
 VK5JY—T. Kilkarni, Station 15 Palawalonga Frontage, 5th Mile, Glenelg, 5045, Postal: Moscow St., Glenelg, 5045.  
 VK5OY—G C Ford, Station: Stanbury Rd., Minlaton, 5575, Postal: P.O. Box 60, Minlaton, 5575.  
 VK5QN—A. J. Smith, Station: Portable, Postal: C/o. Sup't Radio Branch, Adelaide, 5000.  
 VK5QP—J. T. O'Donald, 11 Parkhouse Ave., Seaton, 5023.  
 VK5KC—E. R. Leist, Station: Portable, Postal: C/o. Sup't Radio Branch, Adelaide, 5000.  
 VK5YD—W. H. O'Brien, Station: Portable, Postal: C/o. Sup't Radio Branch, Adelaide, 5000.  
 VK5ZAA—J. D. Bishop, 11 Auburn Ave., Myrtle Bank, 3004.  
 VK5ZFP—Philbrook, 39 Secombe St., Elimbeth Grove, 3113.  
 VK5HJ—E. A. Hayward, 131 Hopkins St., Burleigh, 4232.  
 VK5LD—F. H. Long, 15 Camberwell Rd., Balga, 6051.  
 VK5KEK—B. A. Wheeler, R.F.D.S. Base, Meekatharra, 6842.  
 VK5ZS—W. J. Smith, 133 Fraser St., Geraldton, 6530.  
 VK5AWL—Wireless Institute of Aust. (W.A. Div.), Station: Portable, Postal: G.P.O. Box N1002, Perth, 6001.  
 VK5CIP—P. D. Dodd, Station: Portable, Postal: C/o. 34 Huika Ave., Elanora Heights, 2101.  
 VK5ZCS—B. Howard, C/o. Coogee Caravan Park, Coogee Beach, 6164.  
 VK5IJ—J. S. Zinns, 19 Nicker Cres., Alice Springs, 3750.  
 VK5KPC—C. K. Perry, 68 Milner Rd., Alice Springs, 3750.  
 VK5DAU—S. H. Silby, Station: D.C.A. Res. P., 354 Springfield Rd., Konodobu, P., Postal: P.O. Box 2087, Konodobu, P., 3540.  
 VK5YR—R. C. McPhee, Cocoos Keeling Island.  
 VK5QJM—J. A. Carr, Davis Base.  
 VK5QTM—A. A. Morgan, Macquarie Island.

## CANCELLATIONS

VK1ZRN—R. W. Nash. Not renewed.  
 VK2ZSI—R. R. Iwasenko. Now VK5ATC/T.  
 VK5AIA—E. Anderson. Deceased.  
 VK5AAV—H. W. Deaque. Transferred to N.S.W.  
 VK5ADD—H. L. Daniell. Now VK5IJK.

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- ★ "CQ" Magazine, \$5.70; Three Years, \$13.50.
- ★ "73" Magazine, \$5.50; Three Years, \$11.50.
- ★ "Ham Radio" Magazine, \$5.50; Three Years, \$11.50.
- ★ N.Z.A.R.T. "Break-In", \$2.35.

R.S.G.B., A.R.R.L., "CQ" and "73" Publications also available at special prices.  
 1970 N.Z. Call Book, 75 cents, plus 6 cents postage

Send remittance to F.E. Publications Dept., C/o. P.O. Box 67, East Melbourne, Vic., 3002

Receipt of your first issue will serve as acknowledgment of your sub. Allow six weeks for delivery.

VK5AGB—A. G. Bolton. Transferred to S.A.  
 VK5AU—S. A. Sibley. New VK5AU.  
 VK5JCV—D. J. Bainbridge. Incorrectly addressed. VK5BDJ March Supplement.  
 VK5ZPT—F. H. Birkbeck. Not renewed.  
 VK5ZQ—A. K. Hore. Not renewed.  
 VK5KF—W. A. D. Macaulay. Now VK5RP.  
 VK5ZM—G. C. Tidmarsh. Transferred to N.S.W.  
 VK5NL—A. H. Nicholas. Not renewed.  
 VK5YTS—A. S. Sedgman. Transferred to S.A.  
 VK5ZBG—C W. Bennetts. Now VK5EC.  
 VK5GW—N. G. Wallage. Not renewed.  
 VK5SQ—F. T. Park. Not renewed.  
 VK5ZP—G. A. Tidmarsh. Not renewed.  
 VK5ZXD—J. J. Pischnick. Now VK5JY.  
 VK5AL—L. Stagg. Deceased.  
 VK5ZM—W. E. Muhslein. Deceased.  
 VK5UT—D. G. Miller, Jnr. Returned to U.S.A.  
 VK5XJ—R. Hannaford. Transferred to S.A.  
 VK5XK—Y. K. Young. Transferred to N.S.W.  
 VK5XJ—R. E. Metzger. Not renewed.  
 VK5ZP—J. Muller. Not renewed.  
 VK5ZG—Gokuwa Radio Studio. Not renewed.  
 VK5NT—N. T. Casey. Not renewed.  
 VK5ZDW—D. Weston. Not renewed.



## COOK BI-CENTENARY AWARD

The following additional stations have qualified for the Award:

Cert. No.	Call	Cert. No.	Call	Cert. No.	Call
887	WASTOU	916	W407T	944	XIGACU
888	J4A7PK	917	ZPIAV	945	ZIGACU
889	ZM1CK	918	JASHT	946	ZLIBHE
890	ZM1ZP	919	W407T	947	SMIAZU
891	KL1GHP	920	W4ASYX	948	ZLIBHE
892	AX5QZ	921	ZM1AYH	949	OKIBEMH
893	ZMINX	922	GJ7JW	950	PSFDO1
894	OE5JZ	923	GJ7UT	951	ZM1IB
895	AX4H	924	W407T	952	AX4H
896	ZL1ABD	925	DL50A	953	ZL1KX
897	ZM1BEV	926	OE2WR	954	ZM1KX
898	AX5HEA	927	DK3RS	955	AX5HEB
899	AX5HEB	928	DK4KZ	956	AX5HEAM
900	ZM1BPF	929	AX4KZ	957	JABEJO
901	ZM1BPF	930	W407QOQ	958	AX5HEB
902	WA3JGZ	931	W4KWB	959	W5HJCI
903	WA8UOT	932	W407E	960	W5HJCI
904	AX3JBM	933	W407E	961	VE5H
905	WA3JBM	934	W407E	962	W50AR
906	WA2OFF	935	W407E	963	W50AR
907	DK1KIO	936	W407E	964	JASCAU
908	KL1GQD	937	GJ3MF	965	G5CU
909	EV3YDSD	938	W407U	966	ZM1PF
910	GW3CZPS	939	W407H	967	W4J1LO
911	W407H	940	W407H	968	W407H
912	WA4FDT	941	G4T7V	969	AX5IAWN
913	AX8DD	941	WA2IDM	970	DJ7HZ
914	GM3HGA	942	AX3SPC	971	HP1FAC
915	GW5WFT	943	WS2AS	972	AX5AJL

Certificates: Certificate No. 887 shown on the previous list as W5YOR should read Cert. No. 887 WASTOU.

## V.H.F./U.H.F. SECTION

The following additional stations have qualified for the Award:

Cert. No. 5-AX3ZQZ  
 Cert. No. 6-AX7ZIF



## CANBERRA EASTER CONVENTION

The popular Easter Convention which for many years in the past has been conducted by the Canberra Radio Society (an affiliate of the W.L.A.) is to be resumed after a spell of three years.

The 1971 Easter Convention will be staged at Canberra City on April 9, 10, and 11. An early bird registration is available. The Canberra offers a strong convention committee is arranging a superb week end of Amateur Radio and social activity, with an emphasis on family participation.

Special attractions will include a barbecue luncheon at Springbank Island, a two-hour river cruise on the Yass River, a standard dinner ferry chartered for you by the Canberra Amateurs, and conducted coach tours for wives and children while father is engaged in competitive Amateur Radio events. These attractions plus swimming and trout fishing, will be at no extra cost.

A comprehensive programme is now being prepared and will be sent to you on receipt of your enquiry—either by post or through any member of the Canberra Radio Society. Accommodation will be limited, please book early to avoid disappointment.

## SO YOU HAVE CHANGED YOUR QTH

For as long back as we can remember, the first page of this magazine has shown details for the procedure to be adopted to correctly ensure that your copy of "A.R." will reach you after a change of address. However, it is becoming more and more apparent that the procedure is not being followed as it should be, many members trying to short-circuit the system by notifying us direct.

Instead of helping, this procedure only delays the change in our records, as we have to refer these changes back to the Division concerned. We now make a plea that the procedure that has been laid down be followed, namely when you have a change of address, notify your Divisional Secretary—NOT US. Your Secretary will include the change in his monthly list to us. He knows when and where to send it.

You can help yourself by making sure to advise your Secretary in plenty of time, and not two or three months

later. The number of copies of "A.R." which are returned to us each month with the endorsement "not known at this address," or similar, is reaching quite a large figure. This is involving us in much extra work and expense, as we have to locate the member concerned and re-post the magazine. We have no way of knowing how many "A.R.'s" are delivered although wrongly addressed. May we suggest you check the wrapper from this issue, and if there is any error, notify your Secretary immediately.



## AWARDS FOR TECHNICAL ARTICLES

The Publications Committee considered the allocation of these awards at the December meeting, and as a result, awards have been made to Mr. R. H. Black, VK2QZ, Mr. R. F. Dannecker, VK42ND. The various articles covering "Australis" were also voted into an award, but in view of the number of people involved it was considered im-

practical to try to make a worthwhile award to each and every individual worker on the project. It was, therefore, decided to make the award to the Project Australis Fund.

Our congratulations to the recipients. To the other contributors who just failed to make the grade this year, our thanks, and we hope you will try again.

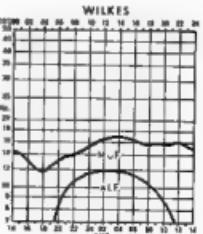
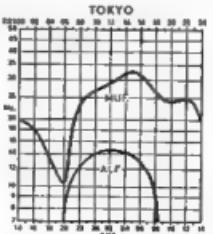
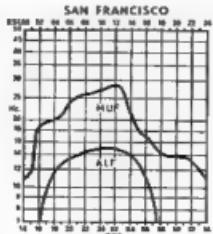
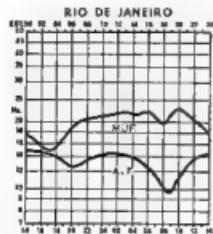
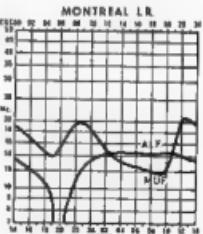
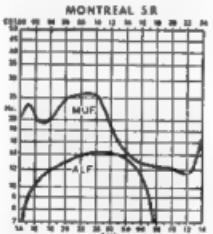
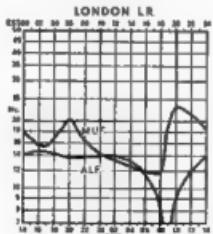
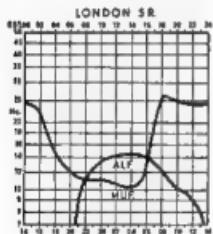
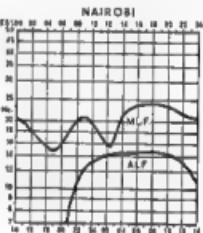
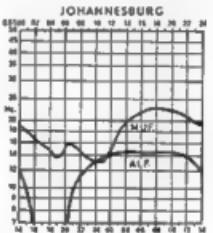
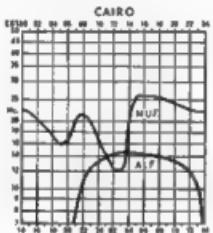
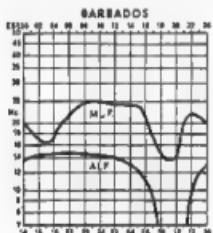


## HIGGINBOTHAM AWARD

This year a somewhat unusual result came from the voting for this award. Two previous winners were well up in the voting, and one man almost made it for the third time. The final outcome was to make the award to the VK3 V.h.f. Group in recognition of the large amount of work they have devoted to their projects over the last two years. Once again, the number of individuals concerned was too many to allow awards to each and everyone, hence the award has been made to the Group as a whole, for them to apply as they wish.

## PREDICTION CHARTS FOR JANUARY 1971

(Prediction Charts by courtesy of Ionospheric Prediction Service)





## B.A.R.T.G. SPRING RTTY CONTEST

The committee of B.A.R.T.G. wish to thank their readers for their past support of these annual events which are organized in order to promote interest in the RTTY mode as used by Radio Amateurs and they hope that the Group will continue to enjoy the continued participation of readers in any future RTTY Contests that the Group may organize. The contest manager looks forward to receiving reader's logs or comments in connection with future RTTY Contests.

### RULES

When: 0800 GMT, Saturday, March 13, until 0200 GMT, Monday, March 14, 1971.

The total contest period is 48 hours, but not more than 36 hours of operation is permitted. Times spent in listening periods count as operating time.

The 12-hour nonoperating period can be taken at any time during the Contest, but off-periods may not be less than two hours at a time. Times on and off the air must be summarized on the log and score sheets. The Contest is also open to SWL RTTY operators.

Bands: 3.5, 7, 14, 21 and 26 MHz. Amateur bands.

Stations may not be contacted more than once on any one band, but additional contacts may be made in the same station if a different band is used.

Country Status: AARL Countries List, except K.L.Y., K.M.F. and V.O. to be considered as separate countries.

Messages exchanged will consist of:

- (a) Time GMT.
- (b) Message number and RST.

### Points:

- (a) All two-way RTTY contacts with stations within one's own country will earn TWO points.
- (b) All two-way RTTY contacts with stations outside one's own country will earn TEN points.
- (c) All stations will receive a bonus of 200 points per country worked, including their own country. Points for each country will be counted again if worked on another band, but continents are counted once only.

### Scoring:

- (a) Two-way exchange points times total countries worked.
- (b) Total country points times number of continents worked.
- (c) Add (a) and (b) together to obtain your final score.

Sample score.

Exchange points (200) x countries (10) = 2000  
Country points (200) x continents (1) = 200  
Total = 2200

**Logs and Score Sheets:** Use one log for each band and indicate any rest periods. Logs to contain: Band, Time GMT, Message and RST Numbers sent and received and Exchange Points. Logs and logs must be received by 31st May, 1971, to qualify.

Awards Certificates will be awarded to the leading RTTY stations and SWL's. The final positions in the Results Table will be decided on the "World Champion of RTTY" Championship.

The judges' decision will be final and no correspondence can be entered into in respect of incorrect or late entries.

Send your Contest logs to:

Ted Double, G8CDW,  
B.A.R.T.G. Contest Manager,  
28 Linden Gardens, Enfield,  
Middlesex, England.



## OPERATION FROM TWO N.Z. COUNTIES

The Gisborne Branch of the N.Z.A.R.T. has decided to operate radio stations in counties with no permanent Amateur activities. The two counties are Waikohu and Walapu.

Following is a schedule of bands and operating times.

Saturday, 6th February, 1971:  
10 Metres: 1500s to 2400s  
20 Metres: 1800s to 2400s  
15 Metres: 1800s to 1600s

Sunday, 7th February, 1971:  
10 Metres: 0700s to 1000s  
20 Metres: 1500s to 1700s  
15 Metres: 1400s to 1600s

Operators will keep a listening post and calls will be made every hour on the hour on the following frequencies:

Waikohu: 3875 KHz, 14225 KHz, 21320 KHz.  
Walapu: 3850 KHz, 14250 KHz, 21330 KHz.

## OBITUARY

C. W. PETERS, VK5SV

We regret to announce the death of Charles William Peters, VK5SV, affectionately known as "Buffalo Bill." Bill passed away on 18th November, 1970, following a long illness.

First on the air in early thirties, Bill went through all the stages of early radio and had great fun with shop jar rectifiers and graduated through 204s, 210s, right through to the Seven 35s.

Bill's kindly disposition endeared himself to all and he was at all times ready and eager to assist the younger members. Bill, unfortunately, had to retire before retiring age and it was then that Amateur Radio came to his aid. Bill, along with the members of the Advisory Committee, was instrumental in the formation of the mobiles. He would call them in turn and see them all into their stables, as he used to say.

We extend our sincere sympathies to his XYL Eva, his son Bill and relatives.

and many other documents currently under consideration.

Other matters discussed were the metrication programme, the programme of future work, and the formation of new technical committees covering capacitors, resistors and printed circuit boards.

The executive of the Telecommunications and Electronics Industry Standards Committee had met to discuss what may be required in their sector by way of metric standards. Their general comment was that the main problem would be associated with the supply of materials and components and with other mechanical engineering aspects of the industry rather than with electrical requirements, which are already standard in terms of SI units.

The executive went on to analyse the types of problem that would be faced by the telecommunications and electronics industry, and noted that there would be some which would be metric for the Metric Convention, and some for the Advisory Committee, e.g. in relation to economic availability of basic materials in rationalised metric sizes, the time programme for conversion, education and training, and some aspects of instrumentation and test equipment. It was decided that the first metric would be some matters for reference to the B.A.A. Metric Standards Advisory Committee, such as conversion data and procedures and rationalisation and preferred numbers.

Finally, the executive recognised that the technical committees under their supervision would need to consider both existing and future standards, to decide what was required by way of conversion of such standards into fully metric terms.

—S.A.A. Monthly Information Sheet.



## CENTRAL COAST AWARD

Commencing from 1st December, 1970, a new award, to be known as the Central Coast Award, will be available to Radio Amateurs throughout Australia and the world.

The award is being sponsored by the Central Coast Amateur Radio Club, Gosford, Central Coast Branch. Details are as follows:

1. Operators of overseas stations may qualify by making radio contact with any two stations in the Central Coast area and by submitting a log, together with two IRCS for return postage via surface mail.

2. VK operators (excluding Central Coast operators) can gain an award by contacting four stations in the Central Coast area plus the club station VK5KAFY and submitting a log, together with 10 cents in postage.

3. Central Coast operators can also gain an award by contacting ten stations in the Central Coast area plus the club station VK5KAFY and submitting a log, together with 10 cents in postage.

4. This award is made available as a h.f. or v.h.f. award. Operators must qualify on either h.f. or v.h.f. bands.

5. Logs to be sent to Awards Manager, Central Coast Branch W.L.A., P.O. Box 338, Gosford, N.S.W., 2250.



## TELECOMMUNICATIONS AND ELECTRONICS (TE/-)

The second meeting of this Industry Standards Committee was held in October following a meeting of the executives of the committee. The chairman, Mr. R. P. Brett (P.M.C. Department), reported that all the technical committees recommended at the first meeting had been constituted and that the seven active technical committees had aggregated a total of 40 meetings. Several sub-committees had been formed, covering such subjects as microcircuits, printed circuit boards, printed circuit assemblies, while a special panel had been formed to deal with polyethylene insulation of telecommunication cables. The committee organisation had been productive, with six new standards reaching the stage of publication, seven drafts being circulated for public review.

## PROVISIONAL SUNSPOT NUMBERS

OCTOBER 1970

Dependent on observations at Zurich Observatory and its stations in Leoparne and Arosa.

Day	R	Day	R
1	62	15	71
2	56	16	83
3	43	17	75
4	54	18	88
5	54	19	86
6	82	20	86
7	71	21	75
8	72	22	88
9	67	23	99
10	72	24	110
11	74	25	116
12	70	26	141
13	63	27	136
14	66	28	138
15	66	29	135
16	66	30	116
17	66	31	116

Mean equals 85.0.

Smoothed Mean for April 1970: 106.8.

Predictions of the Smoothed Monthly Sunspot Numbers

November '70	December '70	January '71	February '71
November '70	December '70	January '71	February '71
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November

# Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

## "BREAK-IN"

September 1970—

**Micro Circuits and Diodes, ZLAIQ.** For the solid state experts. ZLAIQ. "For those in peril. V.V. Line Output Tubes as R.F. Amplifiers. ZLAIQ. "For those in peril. In inexperienced hands these tubes have a life measured in minutes. Once the techniques are mastered in the short time you should not achieve 1,000 hours."

**Burglar Alarms, Some Thoughts and Ideas, ZL2AHS.** How to build and fit a device which will let the outsiders know the outsiders are in.

October 1970—

**Diode Signal Isolators, ZLAIQ.** Solid state switches.

**Circuits for All, VK3GK.** Describes a simple method of drafting.

**Up the Pole, ZL2AY.** Describes a tilt-over antenna.

**S.W.R. and All That, ZL1AT.** Theory for those in need.

**3.8 B. Easter 3 MHz. Phasing Type, ZL4LV.** Some addenda.

## "CQ"

October 1970—

**Good State Permeability Trans V.F.O. with Digital Readout, PAPKEC.** Two BF115 transistors, a few other components and you are away.

**"CQ" Reviews the Collins MLL-1 Linear Amplifier, W2EAD.** For the 100W triode and some tricked out Collins to run away to this linear from a built-in power supply which provides filament, bias, relay and 1800V. plate supplies.

**An Efficient Multi-Mode Antenna, by GW3NA/WB7T.** Tuned on 10, 12, 15, 17, 20, 21, 24, 26, 28, 30, 36, 40, 42, 44, 48, 50, 54, 56, 60, 64, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 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## Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers.

### CAN YOU HELP?

33 Spring Street,  
Lismore, N.S.W., 2480.

Editor "A.R." Dear Sir,

You may be able to assist me with some information or pass on my request to someone who can.

I have obtained an ancient radio receiver which would like to put in working order. It is a 1924 American King's "Newtodynamic" receiver. It is a d.c. five valve on 8, 4-5, 96 volts, and was complete but for valves. I would like to have the valves for 1000A and UX250 for 10. However, it performs not much better than a good crystal set. As it is in good order, I think it should be better despite its age. Possibly the tubes are incorrect. The UX250 has burnt out its filament. If the above performance is unusual, it would be nice to have the volume control fitted.

I would welcome any information you may send possibly from a collector of obsolete equipment you may know of. Congratulations on "A.R." it is a good magazine, I enjoy it.

Thank you for any information you may be able to obtain.

—John Alsop.

### "ASTRONET"

Editor "A.R." Dear Sir,

Ever heard of such a net? It is my privilege to make a public appeal to the amateur about this particular "net". Beginning with Apollo 12, the astronauts were instructed from ground control to dump waste water from the spacecraft at specific times. This waste dumping was conducted in co-operation with the Amateur Astronomical Societies alike around the world. The dumped water consists mainly of a by-product of their electrical system. Some of it is consumed by the astronauts, the remainder is discarded from the spacecraft. This jet stream is formed as a cloud of water around the spacecraft like a "halo". The astronomical Societies are asked to observe the three magnitudes of brightness of the "vapour cloud" and furnish their findings back to Houston.

What has all this to do with Astronet?

Houston confirms the exact times of "dumpings" to Bellcom, who in turn conveys the messages to Amateur Radio stations in the U.S.A. which consist of six call signs "Astronet". The stations in the U.S.A. have co-operated with this particular "Net" with the inevitable results. QRM. I have co-operated with our local Observatory in the past, who was supplied with yards of computer data sheets, straight from Houston, comprising the exact course of the Apollo's.

## KITS

FM IF Strip, 1w. Audio Amp., Voltage Regulator, Pow. Sup., 432 MHz Varactor Mult.  
Ref. add. "A.R." December 1970, p. 22.

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## SILENT KEY

It is with deep regret that we record the passing of—

VK2SV—C. W. Peters  
VK3PI—L. F. Pearson

All we had to know was the times of the actual water dumpings, and that is where yours truly came in. The exact times were from 0100-2200 hours GMT on 21.385 MHz and from 0100-0800 hours GMT on 14.255 MHz.

The point I would like to make is to urge the authorities to give this project its fullest support in publicising and asking Amateur Radio operators to keep the mentioned frequencies clear at those particular times. I can assure you that it was quite hopeless in the past, to note down figures and terms with which you are not 100 per cent. familiar, through the QRM.

So how about some co-operation from this side of the ocean to give this project its fullest support, it surely well deserves it.

Footnote: All present negotiations with Mt. Wilson Observatory, California, are well advanced for the flight of Apollo 14, scheduled for take-off in the end of January 1971.

—Clém Steggink, VK4AF.

### TO AND FROM THE MOON

Editor "A.R." Dear Sir,

May I submit the following information for possible future inclusion in "A.R."

On 12th June, 1965, from a transmitting site approximately 25 miles north of Brisbane, at 145° 30' E.A.T., with a 30 degree rising moon, signals on 144 MHz. were received reflected and received from the moon.

The persons conducting this experiment were Dave VK4ZAX, David VK4ZEK and Peter VK4ZPL.

As these chaps apparently have no intention of announcing their outstanding effort, I feel that full publication of these facts is highly warranted.

Regrettably, time has a habit of obscuring facts, and it is with this in mind only, that I request that this article be given sincere attention.

—John Bisgrove, VK4ZJR.

### AX PREFIX MAKES SUCCESS OF AWARD

Editor "A.R." Dear Sir,

It would like to take the opportunity through this column to thank the many Australian Amateurs who took part in the recent "Cook Bi-Centenary Award" and in fact all who during 1970 made use of the optional AX prefix. From the outset it was clear that the success of the Award was dependent on the use by Australian stations of the AX prefix. The adoption of the new prefix by almost all active h.f. band operators was most gratifying and the basis of the subsequent success of the Award.

At the time of writing, over 1,000 Awards have been issued and as the closing date for applications is not until the end of this year (1971) the present total is sure to be substantially exceeded.

During the past year I have received many letters from overseas and local operators confirming the success of Australian Amateurs using the AX prefix. Unfortunately space would not permit reproduction of even a small percentage of these but I can assure readers that in every case the writers had nothing but praise for the operating ability and courtesy shown by Australian stations. It is quite obvious that a very good image of local operators has been given to the rest of the world during 1970.

I have at some future date to be able to give breakdowns of the number of countries, etc. which have claimed the Award but as the entries are still arriving it would be a little premature to do so at this stage, the final figures I feel sure should be most interesting.

To all those who used the AX prefix I would again say "thank you" as the stations who obtained the Award did so ONLY through your efforts.

—Geoff Wilson, VK3JMK,  
Federal Awards Manager, W.I.A.

Amateurs are reminded that the permit to use the AX prefix ceases on 31st December, 1970.—Ed.

## HAMADS

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**FOR SALE** A band 80 through 10 metres A.M. Transmitter, complete with modulator, power supplies, Geisels V.F.O., \$148, final, \$25, Contact VK4ZJT, Mr. John St. Scarnes, Old, 4866 or in spect at 27 Kintore St. Annand, Brisbane.

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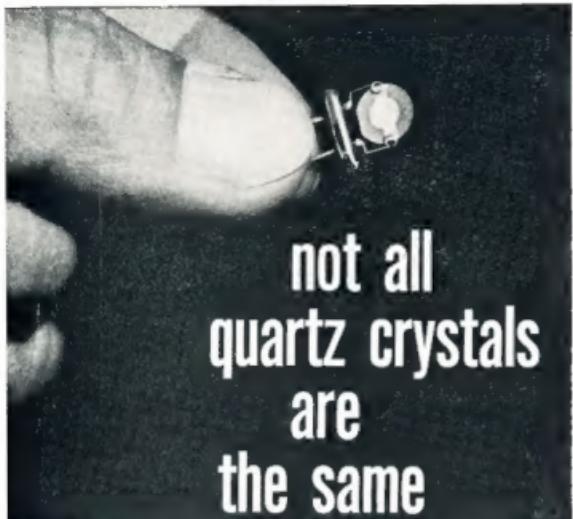
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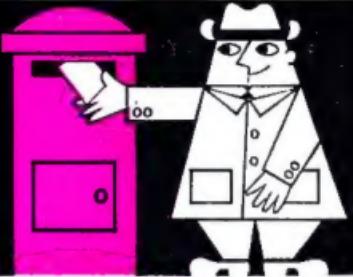
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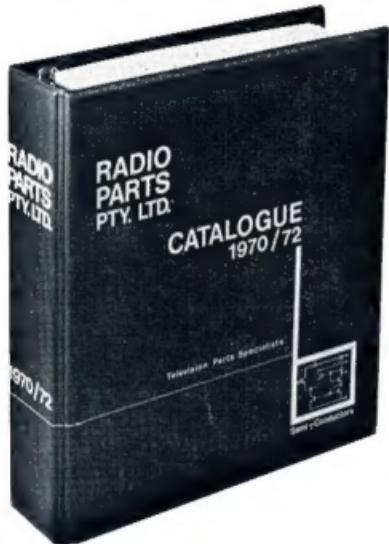
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